DOE/LLW-250b

Licensing an Assured Isolation Facility for Low-Level Radioactive Waste

Volume 2: Recommendations on the Content and Review of an Application

National Low-Level Waste Management Program

July 1998

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Prepared for the
National Low-Level Waste Management Program
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ABSTRACT

This Report provides a detailed set of proposed criteria and guidance for the preparation of a license application for an assured isolation facility (AIF). The Report is intended to provide a detailed planning basis upon which a prospective applicant may begin pre-licensing discussions with the Nuclear Regulatory Commission and initiate development of a license application. The Report may also be useful to the NRC or to state regulatory agencies that may be asked to review such an application. Volume 1 of this Report provides background information, and describes the licensing approach and methodology. Volume 2 identifies specific information that is recommended for inclusion in a license application.

DISCLAIMER

This Report is the product of Department of Energy contractors and independent reviewers who have experience in preparing license applications for fuel cycle facilities, and represents their best technical judgment regarding the contents of such applications and the potential standards that may be used by regulatory agencies for their review.

However, the Report has not been formally reviewed or approved by the U.S. Nuclear Regulatory Commission or specific Agreement State agencies that may be responsible for reviewing and evaluating such license applications. Therefore, any organization planning to prepare a license application for an assured isolation facility, as described in this Report, should consult with applicable regulatory agencies prior to proceeding with the development of such an application.

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FOREWORD

The National Low-Level Waste Management Program (NLLWMP) provides technical assistance to state agencies and compact organizations related to the management and disposal of low-level radioactive waste (LLW). The NLLWMP is operated by Lockheed Martin Idaho Technologies Company at the Idaho National Engineering and Environmental Laboratory, with funding and direction from the Department of Energy's Idaho Operations Office. The NLLWMP was asked by representatives of six states (Connecticut, Massachusetts, Michigan, New Jersey, New York, and North Carolina) to conduct an in-depth examination of regulatory issues related to the licensing, by the U. S. Nuclear Regulatory Commission (NRC) or an NRC Agreement State, of a LLW assured isolation facility (AIF or facility).

This Report has been prepared for the NLLWMP by the law firm of Morgan, Lewis & Bockius LLP (ML&B) with technical assistance from Rogers & Associates Engineering Corporation, Incorporated (RAE). Experience profiles for the preparers and the principal personnel involved in the development of the report are included in Appendix A of Volume 1.

This is Volume 2 of the Report. This volume contains detailed licensing guidance developed for an Assured Isolation Facility (AIF) application. The guidance is limited to those criteria that were determined to be appropriate and necessary for licensing. Volume 1 (DOE/LLW-250a) describes the licensing strategy and discusses issues related to that strategy. Volume 2 provides the following specific information:

- A detailed outline of topics to be covered in an AIF license application in the form of a proposed license application table of contents;

- An identification of the information appropriate and necessary for inclusion in such a license application for each topic -- comparable to an entry in an NRC "standard format and content guide";

- An identification of appropriate regulatory agency review guidance for each application topic -- comparable to an NRC "standard review plan";

- A summary of the bases for selection of the application content information (item 2 above) and agency review guidance (item 3 above), in order to assure that the rationale for selection or rejection of existing NRC guidance is clear.

Due to the nature and scope of various AIF licensing topics, some of the subheadings listed in the Table of Contents (following pages) comprise entire chapters in the Report, while other subheadings are combined into a single chapter. However, in all cases, the identification of appropriate agency review guidance (bullet 4, above) has been organized to match the presentation of information to be included in a license application (bullet 3, above).

TABLE OF CONTENTS FOR A LICENSE APPLICATION FOR AN ASSURED ISOLATION FACILITY

1.0 GENERAL AND INSTITUTIONAL INFORMATION

Application Contents

1.1 Introduction

The applicant should provide general information that should include the applicant's identity, qualifications, and organizational structure; an overview of the purpose and scope of the proposed project; and general information on the applicant's financial and technical qualifications. More detailed organizational and qualification information is called for in Section 3.1 of this guide.

1.2 General Facility Description and Site Location

The applicant should present an overall introduction to the application and a general description of the Assured Isolation Facility (AIF) and its location. This section should enable the reader to obtain a basic overall understanding of the proposed AIF and its operation without having to refer to other sections.

Facility Description

The applicant should describe the facilities, land, buildings, and equipment to be used in the operation of the facility. Where appropriate, scaled engineering drawings should be used. The description should also include the purpose of each feature and the interrelationships of the features. The applicant also should generally describe the movement of personnel, material, and equipment during facility operations. The discussion of the site should include the presence of natural resources and general geological and hydrological characteristics.

Land Use

The applicant should provide a land-use survey based on local land-use plans, aerial photography, topographic maps, or other sources. The survey should include land-use patterns within approximately 10 km of the site. Trends in land use in the vicinity should be identified. Present and projected demographics should be described.

Principal Features

The applicant should describe the following principal features of the AIF:

1. Restricted Areas

   The applicant should describe and display the areas to be restricted as defined in 10 CFR § 20.1003.

2. Site Boundary

   The applicant should describe and display the boundary that encompasses the area owned and controlled by the applicant and indicate the existing and proposed fenced area.

3. Utility Supplies and Systems

   The applicant should identify and describe the utility supplies and systems and the sources of water to be used at the facility, including the location and purpose of supply wells and utility lines, if appropriate.

4. Administration Buildings

   The applicant should describe the functional features of the administration buildings, including laboratories, record storage areas, dining areas, showers, and decontamination and change rooms.

5. Waste Handling Areas

   The applicant should describe the functional features of the waste handling areas, using engineering drawings as appropriate. The features described should include the capabilities for waste reception; off-loading; storage; handling; repackaging of damaged containers; placement of waste packages into concrete containers; the filling of void spaces within concrete containers; isolation of waste in AIF vaults; and decontamination of transport equipment.

6. Decontamination Areas

   The applicant should describe, using engineering drawings as necessary, the facilities to be used for decontaminating, transporting, and handling waste, and

other equipment. The vehicle maintenance area, if appropriate, should be described briefly.

7. Physical Security

The applicant should describe the physical security measures, including barriers to entry and exit points from the site (including controlled access points) and systems for the positive identification of individuals entering and leaving the site.

8. Equipment and Equipment Storage

The applicant should describe the equipment to be used for off-loading, handling, and transporting waste within the AIF, and the facilities to be used for equipment maintenance and storage. Engineering drawings and photos should be included as necessary.

1.3 Schedules

The applicant should provide the proposed schedules for (1) receipt of waste, (2) the first deposit of waste in the AIF and (3) operations.

1.4 Material Incorporated by Reference

Duplication of information should be avoided. Similar or identical information may be recommended in various sections of this guidance document because it is relevant to more than one portion of the facility or the NRC staff's evaluation. The information should be presented in the principal section of the application and appropriately referenced in the other applicable sections.

Reports or other documents that are referenced in the text should be listed at the end of the section in which they are referenced. Where proprietary documents are referenced, a nonproprietary summary of the document should also be referenced. Where appropriate, referenced information may be included as an appendix to the application.

1.5 Conformance to Regulatory Guides

The applicant should note the area and degree of conformance and/or nonconformance to applicable NRC regulatory guides. The reasons for the nonconformance should be given. Included in the explanation should be the alternatives that have been incorporated that support the acceptability of the application.

The applicant should strive for the clear, concise presentation of information. Each subject should be treated in sufficient depth with sufficient documentation to allow evaluation independent of the applicant's analysis. As used here, documentation means information, supporting data and statements and includes: (1) references to published information; (2) citations to the applicant's experience; and (3) reference to unpublished information developed by the applicant or the applicant's consultants.

1.6 Summary of Principal Review Matters

The applicant should include a summary of principal review matters, which should contain documented evidence of efforts to identify major licensing issues during the preparation of the application and objective assessments of licensing issues.

The applicant also should identify specific areas in the application where the principal review matters have been dealt with and resolved.

1.7 Type, Quantity, and Form of Licensed Material

The applicant should describe the nuclear material to be possessed and used under the license by giving the elemental name, maximum quantity, and specifications, including the chemical and physical form of the byproduct, source, or special nuclear material and the maximum mass or curie content. The description should include the waste characteristics and classification as discussed and defined in 10 CFR §§ 61.55 and 61.56.

Agency Review Guidance

The purpose of this review is to establish that the license application includes adequate information identifying the applicant, the general facility, and site description including principal buildings, areas and facilities, and contains other general and institutional information required for the review. Most of the information provided in this chapter is informational in nature and no detailed technical analysis is required. Information provided should be verified as accurate.

General Facility Description and Site Location

In conjunction with the narrative site and facility descriptions, the staff will analyze plan and profile drawings submitted by the applicant. The information will be reviewed for internal consistency and overall logic. Major site operations will be reviewed generally against the material provided to ascertain whether or not they can be conducted safely given the proposed facility layout. The staff will evaluate the feasibility of carrying out emergency procedures, given the proposed layout, using emergency planning information provided by the applicant.

Schedules

The staff will review the applicant's schedules for receipt of waste, first deposit of waste and facility startup to confirm that they are consistent with safe operations.

Material Incorporated by Reference

In certain portions of the application, the applicant may have incorporated by reference procedures, designs, components, features, processes, or studies that have been previously approved for or used in other applications. The NRC staff will review the applicant's discussion of the use of this material in the context of the present application and its pertinence and limitations. Applicable portions of such material should be included as an appendix to the application, and the entire body of information should be referenced. The general applicability of the referenced material will be verified. The staff will also verify whether the applicant has provided pertinent portions of referenced material and has properly annotated references. Where possible, this will be done informally with the originator of the referenced material to determine applicability.

Conformance to Regulatory Guides

The staff will review the applicant's degree of compliance with NRC regulatory guides that relate to specific licensing issues. The staff also will evaluate the areas noted by the applicant where the applicant has failed to comply, the reasons for the noncompliance, the degree of noncompliance, and the incorporated alternatives that the applicant feels support the acceptability of the application.

Summary of Principal Review Matters

The staff will review the applicant's summary of what the applicant considers are principal licensing review matters. The summary will be based on the applicant's experience in similar endeavors and on its efforts in data gathering, analyses, meetings, discussions, and solicitations conducted during the preparation of the application. The staff will also review specific areas identified by the applicant that the applicant has dealt with and, from its perspective, has resolved. The staff will generally cross check the principal review matters with pertinent discussions in other portions of the application to determine if the applicant has dealt with the issue in a rigorous manner.

Type, Quantity and Form of Licensed Material

With respect to the description of licensed material to be possessed, the staff will review whether the application contains the elemental name, maximum quantity, and specifications, including the

chemical and physical form of the licensed material the applicant proposes to possess. For special nuclear material, the specifications include the isotopic content. The staff will ensure that the material meets the characteristics of 10 CFR § 61.56 and is classified in accordance with 10 CFR § 61.55.

Bases for Selection of Application Contents and Agency Review Guidance

Chapter 1, "General and Institutional Information," is drawn primarily from NUREG-1199 and provides general information on the applicant, the site location, the proposed facility, the buildings and areas where operations are conducted, the principal equipment used in AIF operations, and the type, quantity and form of licensed material to be possessed. NUREG-1199 guidelines relating to such topics as disposal unit design, intruder barriers, governmental land ownership, coordination with other governmental bodies and public interest groups, closure, and post-closure institutional control have been deleted. None of these guidelines is necessary for or appropriate to the licensing of an AIF. Draft Reg. Guide 3.52 also was used to add criteria for identifying the type, form, and quantity of licensed material to be possessed. In addition, while NUREGs-1199 and 1200 discuss "Schedules" for various construction-related activities and for decommissioning, these references have been deleted. Unlike a Part 61 disposal facility, an AIF need not obtain a license in order for construction to begin. This is consistent with standard NRC materials-licensing practice. In addition, there is no decommissioning since decommissioning must properly commence once principal activities have ceased at the AIF in accordance with NRC regulations. NUREG-1200 also was edited to focus on key review criteria, and to eliminate information redundant with NUREG-1199.

2.0 SITE DESCRIPTION

Application Contents

The applicant should provide a summary of the site information used in preparing the application and the Environmental Report (see Chapter 10 below). The application should include in summary form the information in sections 2.1 - 2.5 below, as appropriate for the facility. The detailed information necessary to support the site description summary may be included in Chapter 6, "Safety Assessment".

2.1 Geography

The applicant should provide a brief description of the site location. The description should include the identification and relative location of prominent natural and manmade features such as mountains, rivers, highways, airports, population centers, schools, and commercial and manufacturing centers.

2.2 Demography and Land Use

The applicant should summarize the population information for the area of interest based on the latest census results. This should include (1) the population distribution as a function of distance and direction from the site; (2) description, distance, and direction to nearby population centers; (3) description, distance, and direction to nearby public facilities (e.g., schools, hospitals, parks, etc.); (4) description, distance, and direction to nearby industrial areas that may include potential hazards; (5) uses of land in area of interest (i.e., residential, industrial, commercial, agricultural); (6) projections of future population growth near and around the site; and (7) descriptions of potential future developments that could cause large but difficult-to-quantify increases in nearby populations.

Particular attention should be paid to describing nearby facilities or activities that could adversely impact the ability of the AIF to meet relevant Performance Objectives or significantly interfere with the environmental monitoring program.

2.3 Meteorology

The applicant should include a summary of the meteorological data for the site including (1) frequency of wind speed and wind direction; (2) annual amount of precipitation; and (3) type, frequency, and magnitude of severe weather (e.g., tornado, hurricane, etc.).

2.4 Hydrology

The applicant should include a brief description of the hydrology of the site including (1) upstream drainage features; (2) characteristics of nearby rivers, streams, and bodies of water as appropriate; (3) distance to the water table; (4) evaluation for 100-year flood; and (5) potential for frequent ponding. Available information may be used, supplemented as necessary by the results of additional site investigation.

2.5 Geology and Seismicity

The applicant should include a brief description of the geology and seismology for the area. Available information may be used, supplemented as necessary by the results of additional site investigation. The description should include (1) locations of active faults near the site, (2) the presence of sinkholes or karstic formations near the site (if any), (3) stratigraphic profile through the site, and (4) and analysis of earthquake potential.

Agency Review Guidance

The purpose of this review is to determine that the information provided by the licensee adequately describes the geographical, demographic, meteorological, hydrological, geological, and seismological characteristics of the site and the surrounding area. The site description is a summary of the information used by the applicant in preparing various portions of the application, including the Environmental Report.

The types of information the staff may review should include the following (as appropriate for the facility being reviewed):

1. Site Geography

    a. Site location (state, county, municipality);
    b. Plant boundaries and locations of features (structures, areas, etc.) where licensed activities will be conducted;
    c. Major nearby transportation corridor;
    d. Nearby bodies of water;
    e. Nearby significant terrain features.

2. Demography and Land Use

    a. Latest census results for area of concern;
    b. Projections of future population growth;

c. Description, distance, and direction to nearby population centers;
d. Description, distance, and direction to nearby public facilities (e.g., schools, hospitals, parks, etc.);
e. Description of, distance to, and direction to nearby industrial areas that may include potential hazards and which might adversely impact the ability of the site to meet relevant Performance Objectives or interfere with site monitoring;
f. Uses of land in area of concern (i.e., residential, industrial, commercial, agricultural).

3. Meteorology

a. Frequency distribution for wind speed and wind direction;
b. Annual amount of precipitation;
c. Type, frequency, and magnitude of severe weather (e.g., tornado, hurricane, etc.).

4. Hydrology

a. Upstream drainage and flash flood potential;
b. Characteristics of nearby rivers, streams, and bodies of water as appropriate;
c. Distance to the water table;
d. Potential for frequent ponding;
e. Evaluation for 100-year flood.

5. Geology and Seismicity

a. A surface geologic map;
b. Stratigraphic profile;
c. A description of regional geomorphology;
d. Indications of presence or absence of major active faults and subsurface solution features;
e. An analysis of earthquake potential, including magnitude and frequency.

The site description summary should provide:

1. A brief description of the site geography, including its location relative to prominent natural and man-made features such as mountains, rivers, airports, population centers, schools, commercial and manufacturing facilities;

2. A brief description of the locations within the site of features (structures, areas, etc.) where licensed activities will be conducted;

3. Population information based on the most current census data to show population distribution as a function of distance from the facility;

4. Population growth data;

5. Site-specific meteorological data;

6. A brief description of the hydrology, geology, volcanology, and seismicity for the area.

Bases for Selection of Application Contents and Agency Review Guidance

Chapter 2, "Site Description," is drawn from draft Reg. Guide 3.52 and draft NUREG-1520, rather than NUREG-1199 and NUREG-1200. The AIF will not be licensed for the permanent disposal of low level waste (LLW). Therefore, the information to be provided on site characteristics need not be nearly as extensive as would be required if the applicant were seeking to demonstrate compliance with 10 CFR Part 61 disposal site suitability requirements including, for example, capability to characterize, model, analyze and monitor (§ 61.50(a)(2)). NUREG-1199 contains very extensive criteria for the development of detailed information on such topics as geology and seismicity, hydrology, and geotechnical characteristics that are geared toward demonstrating the ability of the disposal site to meet the Part 61 performance objectives for near surface disposal after active monitoring has ceased. For an AIF, in which no such authority is being sought, such criteria are overly stringent and unnecessary. Site descriptive information comparable to that required for a fuel cycle facility applicant should be more than adequate for licensing a passive AIF.

3.1 ORGANIZATIONAL STRUCTURE

Application Contents

The applicant (1) should provide organizational charts showing the corporate level management and technical support structure, including the relationship of that part of the structure responsible for waste handling and isolation to the rest of the corporate organization, and a description of the specific provisions that have been made for technical support for operations and (2) should identify the organizational unit and any augmenting organizations, or other personnel, that will manage or execute any phases of the waste management program, including the responsibilities and authority of the principal participants.

The applicant should (1) identify in terms of numbers, the educational background and experience requirements for each identified position or class of positions providing technical support for facility operations and (2) include the specific educational background and experience for individuals in the management and supervisory positions that will provide support in the areas identified below.

The special capabilities of the support group for the operation of the facility should include:

1. Health physics and radiation protection;
2. Maintenance support;
3. Operations support;
4. Quality assurance;
5. Training;
6. Safety review;
7. Fire protection;
8. Outside contractual assistance.

Agency Review Guidance

The staff will review the corporate level management and technical organizations of the applicant and its major contractors for the project, including the technical resources to support operation. The objective of this review is to ensure that the corporate management is involved with, informed about, and dedicated to the safe operation of the facility, and that sufficient technical resources have been or are being and will be provided to adequately accomplish this objective.

The corporate-level management and technical support structure, as demonstrated by organizational charts and descriptions of functions and responsibilities, should clearly define primary responsibilities. A corporate officer should clearly be responsible for radioactive waste activities, without having ancillary responsibilities that might detract his/her attention from radiological safety matters. The staff must recognize that there are many acceptable ways to define and delegate job responsibilities.

With respect to technical support for operations, the applicant's plans for headquarters staffing may not yet be firm. It is acceptable, therefore, if these plans are not fully specific in terms of numbers of people, provided the applicant has made a sufficiently firm commitment to ensure the responsibility can be met. Variations in staffing may also be expected between applicants who lack prior experience with waste handling operations and those who have such experience. It is important that the staff assure itself that applicants in the former category do not underestimate the magnitude of the task. The staff should be alert to the possibility that excessive workloads may be placed on too small a number of individuals.

The information should meet the following conditions:

1. The applicant has identified and described the organizational groups responsible for implementing the responsibilities for the initial test program and technical support for the operation of the facility.

2. The applicant has described the method of implementing its responsibilities regarding the initial test program, technical support, and operation of the facility.

3. The organizational structure provides for the integrated management of activities that support the operation and maintenance of the facility.

4. Clear management control and effective lines of authority and communications exist between the organizational units involved in management, operation, and technical support for the operation of the facility.

5. Substantive breadth and level of experience and availability of personnel exist to implement the responsibility for technical support for the operation of the facility. (The need to supplement the corporate structure with additional experienced personnel for the initial years of operation will be determined on a case-by-case basis.)

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 and NUREG-1200 are the primary sources for Section 3.1 "Organizational Structure." Those documents discuss organizational structure for both the design and construction phase, and the operations phase. All references to design and construction organization have been removed because, as a materials license applicant, the AIF applicant need not obtain NRC licensing approval to design or construct the AIF. This is to be distinguished from a disposal facility licensed under 10 CFR Part 61. (See 10 CFR § 61.3(b).) Certain limited criteria also have been deleted because they relate to near-surface disposal facility functions and not to an AIF. For example, NUREG-1999 requests that information be provided on the special capabilities of the operations support group in the area of "engineering geology" that is not required for an AIF. Similarly, NUREG-1200 states that the applicant's corporate organization and technical staff for "closure and post-closure activities" will be evaluated. These criteria have been deleted.

3.2 QUALIFICATIONS OF APPLICANT

Application Contents

The applicant should provide the following:

1. An organization chart should be provided showing the title of each position, the minimum number of persons to be assigned to common or duplicate positions, and (if appropriate) the number of operating shift crews.

2. The functions, responsibilities, and authorities of facility positions corresponding to the following should be given:

    a. Overall facility management;
    b. Operators supervision;
    c. Operating shift crew supervision;
    d. Technical supervision;
    e. Radiation protection supervision;
    f. Maintenance supervision;
    g. Emergency supervisory structure;
    h. Quality assurance supervision (when part of the facility staff).

    For each position, where applicable, required interactions with offsite personnel or personnel in positions identified in Section 3.1 of this guidance should be described. Because such interactions include defined lines of reporting responsibilities, the following should also be described: (a) the line of succession of authority and responsibility for overall facility operation if unexpected occurrences of a temporary nature should occur; and (b) the authority that may be delegated to operating supervisors and to shift supervisors, including the authority to issue standing or special orders.

    If the facility contains or is planned to contain facilities other than those described in the application, this section should also describe interactions with the organizations operating such facilities. The description should include any proposed sharing of persons between the facilities, a description of their duties, and the proportion of time each person will routinely be assigned to the other facility.

3. The position titles of management staff members, the total number of people planned to staff each shift, and the proposed means of assigning shift responsibility for implementing the radiation protection and emergency programs on a round-the-clock basis (if appropriate) should also be described.

4. The education, training, and experience (qualification) requirements established by the applicant for filling each management, supervisory, or radiation safety position in the operating organization above should be described. At the application stage, it is recognized that many details of the facility organization and staffing may not have been made final. The section should eventually provide evidence, in the form of personnel resumes, that the initial selections of persons to fill management and principal supervisory positions down through the shift supervisory level are acceptable.

Agency Review Guidance

Facility staff organizational structures are not rigidly fixed; however, experience has shown that certain components are common to and necessary for all facilities. Among these are operational, onsite technical support, and maintenance groups under the direction and supervision of a facility manager. Also necessary is a radiation safety officer who reports directly to a headquarters safety officer.

The operating organization, as demonstrated by organization charts and descriptions of functions and responsibilities, should be free of ambiguous assignments of primary responsibility. Operating responsibilities should be reasonably well defined in terms of both numbers of persons and experience required to implement their responsibilities. The staff must recognize that there are many acceptable ways to define and delegate job responsibilities. Variations in staffing may also be expected between applicants who lack experience with waste operations and those who have such experience. It is important that the staff makes certain that applicants in the former category do not underestimate the magnitude of the task. The staff should be alert to the possibility that excessive workloads may be placed on too small a number of individuals.

The structure of onsite technical support and maintenance groups may depend somewhat on headquarters staffing and the division of effort between onsite and offsite personnel.

At the initial application stage, the applicant generally will not have selected persons to fill facility staff positions. The review procedure, therefore, is to examine this section of the application for a commitment on the part of the applicant to conform to the stated acceptance criteria.

"Applicable experience" should be judged in light of the position responsibility. Credit for experience, which may be entirely applicable, should be weighed to a degree commensurate with its applicability.

In addition, if the applicant, at the time of the review, has had experience in waste operations, the staff may seek independent information on facility staffing and qualifications by consulting with NRC inspection and enforcement personnel, or by reviewing inspection reports, or by consulting with State personnel with similar responsibilities.

The staff will then determine, on the basis of the foregoing, the overall acceptability of the applicant's operating organization and plant staffing plans. This determination necessarily will be somewhat qualitative.

The applicant should demonstrate a commitment to and implementation of plans to staff the operating organization and to define and delegate responsibilities to provide assurance that the facility can be operated safely by meeting the following evaluation criteria:

1. The reporting responsibility and authority of the functional areas of radiation protection, quality assurance, and training ensure independence from operating pressures. In most facilities, overall management and technical direction in these areas may be concentrated at corporate headquarters.

2. Lines of authority to the facility manager are clear.

3. Responsibility for all activities important to the safe operation of the facility is clearly defined and independent of production operations.

4. Distinct functional areas are separately supervised and/or managed.

5. Managers are qualified to provide adequate backup should the incumbent be absent.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 3.2 "Qualifications of Applicant." It has been adopted in its entirety. The related SRP section (NUREG-1200, section 8.2) has been edited to focus on key review criteria and to remove information redundant with NUREG-1199.

3.3 TRAINING PROGRAM

Application Contents

The applicant should describe the training and retraining programs for the facility staff and the scheduling of these programs. The program descriptions should include the following:

1. The proposed subject matter of each course, the duration of the course (approximate number of weeks in terms of full-term attendance), the organization teaching the course or supervising instruction, the qualification of instructors, and the position titles of the persons who will be taking the course;

2. A commitment to conduct an onsite formal training program and on-the-job training so that the entire facility staff will be qualified before the initial receipt of radioactive waste;

3. Plans for conducting a position task analysis for all operating personnel, in which the tasks performed by the person in each position are defined and the training, in conjunction with education and experience, to provide assurance that the tasks can be effectively performed;

4. Procedures for the orientation of incidental site visitors with regard to site safety and radiation protection;

5. The proposed means for evaluating the effectiveness of the training program for all employees;

6. Any difference in the training programs for individuals on the basis of experience, which should be categorized as follows:

    a. No previous experience;
    b. Experience at facilities not subject to licensing;
    c. Experience at comparable facilities.

The applicant should submit a chart showing the schedule for each part of the training program for each position or organizational unit identified in the application. The time scale should be relative to expected operation.

The applicant should show clearly to what extent the training program has been accomplished at the approximate time of the submittal of the application. Contingency plans for additional

training should be described in the event operation is significantly delayed from the date indicated in the application.

The applicant should describe the plans for the retraining of facility personnel, identify the additional position categories on the facility staff for which retraining will be provided, and describe the nature, scope, and frequency of such retraining.

Agency Review Guidance

The staff should ensure that, whenever the applicant has committed to follow the position of a regulatory guide, industry standard, or other reference document, the specific revision being referred to is identified. Similarly, whenever the staff is using a position in a reference document as a basis for acceptability, the revision being used should be identified.

The staff also should ensure that the applicant has committed to a reasonable schedule for the training programs that relates to the date for the start of operations.

The staff will then determine, on the basis of the foregoing, the overall acceptability of the applicant's plant staff training plans.

The applicant should demonstrate that the training provided, or to be provided, for each position on the facility staff will be adequate to ensure that all facility staff personnel training requirements will be met at the time needed, that is, before waste operations or before appointment or reappointment to the position.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 3.3 "Training Program". It has been adopted in its entirety. The related SRP section (NUREG-1200, section 8.3) has been edited to focus on key review criteria and to remove information redundant with NUREG-1199.

3.4 EMERGENCY PLANNING

Application Contents

The applicant should adhere to the following:

1. The applicant must provide an evaluation showing that the maximum dose to a person offsite due to a release of radioactive materials would not exceed 1 rem effective dose equivalent or 5 rems to the thyroid, or provide an emergency plan for responding to a release of radioactive material.

2. One or more of the following factors may be used to support an evaluation submitted under paragraph 1 above:

    a. The radioactive material is physically separated so that only a portion could be involved in an accident.

    b. All or part of the radioactive material is not subject to release during an accident because of the way it is isolated or packaged.

    c. The release fraction in the respirable size range would be lower than the release fraction shown in 10 CFR § 30.72 due to the chemical or physical form of the material.

    d. The solubility of the radioactive material would reduce the dose received.

    e. Facility design or engineered safety features in the facility would cause the release fraction to be lower than shown in 10 CFR § 30.72.

    f. Operating restrictions or procedures would prevent a release fraction as large as that shown in 10 CFR § 30.72.

    g. Other factors appropriate for the specific facility.

3. If an emergency plan for responding to a release of radioactive material is required, it must include the following information:

    a. Facility description. A brief description of the licensee's facility and area near the site;

b. Types of accidents. An identification of each type of radioactive materials accident for which protective actions may be needed;

c. Classification of accidents. A classification system for classifying accidents as alerts or site area emergencies;

d. Detection of accidents. Identification of the means of detecting each type of accident in a timely manner;

e. Mitigation of consequences. A brief description of the means and equipment for mitigating the consequences of each type of accident, including those provided to protect workers onsite, and a description of the program for maintaining the equipment;

f. Assessment of releases. A brief description of the methods and equipment to assess releases of radioactive materials;

g. Responsibilities. A brief description of the responsibilities of licensee personnel should an accident occur, including identification of personnel responsible for promptly notifying offsite response organizations and the NRC, and responsibilities for developing, maintaining and updating the plan;

h. Notification and coordination. A commitment to and a brief description of the means to promptly notify offsite response organizations and request offsite assistance, including medical assistance for the treatment of contaminated injured onsite workers when appropriate; (A control point must be established. The notification and coordination must be planned so that unavailability of some personnel, parts of the facility, and some equipment will not prevent the notification and coordination. The licensee shall also commit to notify the NRC operations center immediately after notification of the appropriate offsite response organizations, and not later than one hour after the licensee declares an emergency.)

I. Information to be communicated. A brief description of the types of information on facility status, radioactive releases, and recommended protective actions, if necessary, to be given to offsite response organizations and to the NRC;

j. Training. A brief description of the frequency, performance objectives and plans for the training that the licensee will provide workers on how to respond to an emergency, including any special instructions and orientation tours the licensee would offer to fire, police, medical, and other emergency personnel; (The training shall familiarize personnel with site-specific emergency procedures. Also, the training shall thoroughly prepare site personnel for their responsibilities in the event of accident scenarios postulated as most probable for the specific site, including the use of team training for such scenarios.)

k. Safe shutdown. A brief description of the means of restoring the facility to a safe condition after an accident;

l. Exercises. Provisions for conducting quarterly communications checks with offsite response organizations and biennial onsite exercises to test response to simulated emergencies; (Quarterly communications checks with offsite response organizations must include the check and update of all necessary telephone numbers. The licensee shall invite offsite response organizations to participate in the biennial exercises. Participation of offsite response organizations in biennial exercises although recommended is not required. Exercises must use accident scenarios postulated as most probable for the specific site and the scenarios shall not be known to most exercise participants. The licensee shall critique each exercise using individuals not having direct implementation responsibility for the plan. Critiques of exercises must evaluate the appropriateness of the plan, emergency procedures, facilities, equipment, training of personnel, and overall effectiveness of the response. Deficiencies found by the critiques must be corrected.)

m. Hazardous chemicals. A certification that the applicant has met its responsibilities under the Emergency Planning and Community Right-to-Know Act of 1986, Title III, Pub. L. 99-499, if applicable to the applicant's activities at the proposed place of use of the radioactive material.

4. The applicant shall allow the offsite response organizations expected to respond in case of an accident 60 days to comment on the licensee's emergency plan before submitting it to NRC. The licensee shall provide any comments received within the 60 days to the NRC with the emergency plan.

Agency Review Guidance

The NRC has developed Regulatory Guide 3.67 (January 1992) that provides a "Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities." Reg. Guide 3.67 tracks the materials licensing regulations discussed above under "Application Contents" and can be used both by the AIF applicant in preparation of the application and the NRC in reviewing the application. There is no SRP comparable to Reg. Guide 3.67.

Bases for Selection of Application Contents and Agency Review Guidance

The Application Contents guidance for section 3.4 "Emergency Planning" is drawn primarily from 10 CFR § 30.32(i). This is a detailed regulation that provides specific criteria for determining: (1) whether an emergency plan is required for a Part 30 byproduct material facility based on an assessment of projected maximum doses; and (2) if so, the contents of such a plan. The Part 61 standard format and content guide (NUREG-1199) and SRP (NUREG-1200) were not utilized in selecting the appropriate Emergency Planning guidance for an AIF because they appear to include criteria that go beyond the existing Part 61 regulations as well as the current and draft regulatory requirements and criteria applicable to other NRC materials licensees.

In particular, NUREG-1200 provides for the development of an emergency plan regardless of the results of a dose assessment, calls for development and review of offsite emergency plans similar to commercial power reactor plans, and contains dose criteria for development of emergency procedures that are more stringent than Part 30 or Part 70 requirements. There is no explicit basis for such criteria in Part 61. The Agency Review Guidance references NRC Reg. Guide 3.67 "Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Licensees."

A more detailed discussion of the bases for selection of the above Emergency Planning guidance is provided in Section IV.G in Volume 1 of this Report.

3.5 REVIEW AND AUDIT

Application Contents

The applicant should describe the provisions for the facility operations staff's review of operational activities, the independent review of facility operations, and the independent assessment of activities pertaining to safety enhancement. Specific information should include the following:

1. The functioning of the onsite organization with respect to the review of proposed changes to systems or procedures and of unplanned events that have operational safety significance, including subject matter to be reviewed, organizational provisions for conducting the reviews (including personnel), and the documentation and reporting of review activities;

2. The procedures and organization used to evaluate safety-related operational activities independent of the operating organization, including how and when such a program is to be implemented, subject matter to be reviewed, organizational provisions for conducting the review (including personnel), and the documentation and reporting of review activities;

3. The provisions to perform independent reviews and assessments of facility activities, including the functions of the review group, organizational provisions for conducting the activities (including personnel), and the documentation and reporting of these activities.

Agency Review Guidance

The staff will evaluate the applicant's plan for conducting reviews and audits of operational activities that are important to safety, as described in the application. The primary focus of the review should be on the provisions that will be used to implement the applicant's responsibility for proposed changes to the facility and on the procedures for after-the-fact review, evaluation of unplanned events, and evaluation of facility operations.

Facility Staff Review

1. Organizational arrangements should provide for interdisciplinary reviews of subject matter.

2. Qualification levels for plant staff personnel performing reviews should be provided.

3. Review activities should be documented, and the results should be forwarded to appropriate members of management.

Independent Review

Provisions for independent review should include the formation of an independent safety review group at the corporate level that should meet the following criteria:

1. The functions of this group should be independent of those performed to meet items (1) and (2) in the Application Contents guidance provided above.

2. The group should (a) examine facility operating characteristics, NRC issuances, and other appropriate sources of information on facility design and operating experience in the area of safety improvement and (b) maintain surveillance of facility operations and maintenance activities to provide independent verification that these activities are performed correctly and that human errors are reduced as far as practicable.

3. The group should perform independent reviews and audits of facility activities (including maintenance and modifications), operational problems, and operational analysis and AIF in the establishment of programmatic requirements for facility activities.

4. The group should provide to management no less frequently than quarterly a summary of its activities to advise management on the overall quality and safety of operations.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 3.5 “Review and Audit.” It has been adopted in its entirety. The related SRP section (NUREG-1200, section 8.5), has been edited to focus on key regulatory review criteria and to remove information redundant with NUREG-1199.

3.6 FACILITY ADMINISTRATIVE AND OPERATING PROCEDURES

Application Contents

The applicant should describe the administrative procedures that provide control over activities that are important to the safe operation of the facility and the procedures for operation that will ensure that routine operating, abnormal, and emergency activities are conducted in a safe manner. In general, detailed written procedures do not have to be included in the application; however, the applicant should provide general descriptions pertaining to the nature and control of the following procedures:

Administrative Procedures

1. Procedures for review and approval;
2. Equipment control procedures;
3. Procedures pertaining to the control of maintenance and modifications;
4. Emergency planning procedures;
5. Temporary changes to procedures;
6. Procedures pertaining to standard orders to facility personnel, including authority and responsibility of key site personnel (site managers, assistant managers, and site radiological control and safety officer);
7. Training and orientation procedures;
8. Procedures pertaining to access to control area(s);
9. Quality assurance/quality control procedures.

Operating Procedures

1. Procedures for systems operation;
2. Waste receipt and inspection procedures;
3. Waste handling procedures;
4. Vehicle survey and release procedures;
5. Abnormal, temporary, and emergency procedures;
6. Instrument calibration and test procedures;
7. Facility maintenance procedures;
8. Environmental monitoring, sampling, and testing procedures.

Because most of the information in this portion of the application is related directly to information in other portions of the application, the applicant should provide cross-references as appropriate.

Agency Review Guidance

The staff will review (1) the administrative procedures that provide control over activities that are important to the safe operation of the facility and (2) the operating procedures that ensure that activities under routine operating, abnormal, and emergency conditions will be conducted in a safe manner. In general, detailed written procedures do not have to be included in the application. However, the applicant should provide general descriptions of the nature and control of the procedures.

To evaluate most of the information, the staff must use informed judgment based on experience, site visits to similar facilities, and discussions with the applicant to make a qualitative determination of the adequacy of the procedures provided by the applicant.

Where feasible and necessary to make its determinations, the staff will "walk through" specific procedures with the applicant.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 3.6 "Facility Administrative and Operating Procedures." It has been adopted in its entirety, except that provisions calling for the development of procedures governing "storage and disposal" and "trench design and construction" have been deleted. The related SRP section (NUREG-1200, section 8.6) has been edited to eliminate references to these same procedures, to focus on key review criteria, and to remove information redundant with NUREG-1199.

3.7 PHYSICAL SECURITY

Application Contents

The applicant should provide the plans for implementing security measures relating to the layout of the facility and other design features and equipment arrangements intended to provide protection of nuclear materials against theft, tampering, or radiological sabotage.

The applicant should describe the comprehensive physical security program for the facility, including the physical security organization, access controls to the facility, means of detecting unauthorized intrusion, provisions for monitoring access to controlled areas, communication systems related to security, intrusion alarm systems, arrangements with law enforcement authorities to provide assistance in responding to security threats, and response to unusual events. The implementation schedule for the physical security program should include diagrams, to approximate scale, displaying the following:

1. Location of alarm stations;
2. Location of access control points to controlled areas;
3. Location of relevant law enforcement agencies and their geographical jurisdictions (on separate map to approximate scale);
4. Interaction of facility operations staff with the security staff.

The response capabilities of local law enforcement agencies during operational and nonoperational hours should also be provided.

Agency Review Guidance

The staff will review the general facility description and site-related information to determine if there are unique features that should be considered in establishing the physical security program. At this stage, it is desirable that the staff discuss the formulation of this program with the applicant.

The staff will review the physical security plan to determine its conformance with the regulations and criteria of this guidance. It will use as checklists the requirements and recommendations of industry standards for such devices as fences, gates, and locks. Site visits are not mandatory, but may be appropriate where siting and design anomalies introduce unique security problems.

1. Access Requirements

   The applicant should control all points of personnel and vehicle access into controlled radiological areas. All individuals should be identified and authorization should be checked.

2. Testing and Maintenance

   The applicant should test and maintain intrusion alarms, communication equipment, and other security-related equipment and should maintain passive security devices.

3. Response Requirements

   The applicant should provide a liaison with local law enforcement authorities to provide additional security during nonworking hours.

The physical security program should be implemented 1 to 2 months before receipt of waste.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 3.7 "Physical Security." It has been adopted in its entirety. The related SRP section (NUREG-1200, section 8.7), has been edited to remove references to implementation of the physical security program 1 to 2 months "before fuel loading" and other references to "fuel" storage that appear to be in error, and to replace such references with a provision to implement the security program 1 to 2 months before "receipt of waste."

4.1 PRINCIPAL DESIGN FEATURES

Application Contents

The applicant should describe the principal features of the facility that are designed to provide isolation of the waste. Principal features should be identified and described for each of the following seven functional requirements: (1) minimizing the infiltration of water into the facility; (2) ensuring the integrity of the assured isolation units; (3) providing for the structural stability of waste and covers; (4) prevent contact of waste with standing water; (5) providing adequate site drainage during operations; (6) maintaining occupational exposure as low as is reasonably achievable (ALARA); and (7) providing adequate monitoring.

The principal features are to be clearly described in relationship to each other to demonstrate that all of the features have been carefully considered in a coherent AIF plan. Specific design details (validity of assumptions, methods employed, results of studies and calculations, etc.) and principal design criteria for the seven principal features are to be provided by the applicant in other appropriate sections where this information is identified. The applicant should supply the following minimum descriptive information for each of the principal design features.

Water Infiltration

The applicant should provide information on (1) the covers or other protective features over the vaults that are designed to direct onsite precipitation away from the isolation units, and (2) the onsite drainage systems that are designed to direct onsite precipitation and flow from offsite precipitation and groundwater away from the isolation units.

Isolation Unit Integrity

The applicant should describe both the earthen cover over the concrete vaults, where utilized to protect, for example, against freeze-thaw cycles, or other suitable protection provided to assure integrity of the concrete vault covers, and divert precipitation and infiltrating water away from the concrete vaults. The applicant should also describe the concrete vaults themselves.

The applicant should describe the measures to be used to ensure the integrity of the isolation unit under physical loads and potential chemical attack, including the unit's resistance to degradation from surface geologic processes and biotic activity.

Structural Stability

The applicant should provide information on the structural stability of the waste, vault roof, and cover and other design features that are directed toward isolation of the waste during the facility's operational life. The discussion of the feature designed to ensure structural stability of the waste, including concrete containers, concrete vault roof, and cover or other design feature is acceptable if the design feature is clearly described and shown to be coordinated in the overall AIF plan. At a minimum, the description of the feature that is designed to ensure structural stability should address how long term isolation of the waste has been considered.

Contact With Standing Water

The applicant should provide information on measures to provide reasonable assurance that contact of waste with standing water during periods of facility operations will be avoided.

Site Drainage

The applicant should provide information on adequate site surface drainage provisions during operations. The applicant should describe measures that will direct surface water away from the waste, and which will direct surface water drainage away from the isolating units at velocities and gradients that will not result in erosion of surface and subsurface soils of isolation units.

Occupational Exposure

The applicant should provide information on measures to be taken to maintain occupational exposures as low as is reasonably achievable.

Site Monitoring

The applicant should provide information on the operational environmental monitoring and surveillance programs to be conducted at the AIF site. The applicant should provide information on monitoring the integrity and structural stability of the AIF.

Agency Review Guidance

Design details and principal design criteria for the seven principal isolation features that are described in this section of the guidance are covered in greater depth in other sections. The major reason that the principal features are addressed in this section is to ensure that the applicant provides a clear description in one section of all the principal features with regard to their

relationship to each other, and to demonstrate that all of the principal features have been carefully considered in a coherent AIF plan.

Water Infiltration

The applicant's discussion of the feature of the AIF designed to minimize the infiltration of water into the isolation unit should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan. At a minimum, the description of the feature should include: (1) the covers over the waste or other design features that are designed to direct onsite precipitation away from the isolation unit; and (2) onsite drainage systems that direct onsite precipitation, flow of offsite precipitation, and groundwater away from the isolation units.

Isolation Unit Integrity

The discussion of the feature designed to ensure the integrity of the isolation units, including the cover, or other protective feature, and vault, should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan. At a minimum, the description of the feature that is designed to ensure isolation unit integrity should describe how performance for the required period of time is provided for.

Structural Stability

The discussion of the feature designed to ensure structural stability of the waste, including any concrete containers, vault roof, and cover or other protective feature should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan. At a minimum, the description of the feature that is designed to ensure the structural stability of the waste, vault roof, and cover should address how long term isolation of the waste has been considered.

Contact With Standing Water

The discussion of the feature designed to avoid contact of waste with standing water should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan. At a minimum, the description of the feature that is designed to provide site drainage should address measures that will direct water away from the isolated waste.

Site Drainage

The discussion of the feature to provide site drainage during operations should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan. At a minimum, the description of the feature that is designed to provide site drainage should address measures that will direct surface water away from the isolated waste and assured isolation units.

Occupational Exposure

The discussion of the feature designed to maintain occupational exposures as low as is reasonably achievable should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan.

Site Monitoring

The discussion of the feature designed to provide adequate monitoring of the AIF site should provide a clear description of the design feature and should demonstrate that the feature is coordinated in the overall AIF plan.

The applicant should adequately identify the design features for environmental monitoring of the atmospheric and direct radiation pathways, with close monitoring of the waste canisters and assured isolation vaults and covers or other protective features. The concrete canisters will be emplaced with sufficient space between the canisters and the vault walls to allow for active monitoring and maintenance within the assured isolation units. This will ensure that any releases from concrete canisters will be contained and promptly remediated within the assured isolation units themselves. The AIF should also include design features such as leachate collection and leakage detection systems to verify that releases are not escaping the assured isolation units.

The applicant should adequately identify the engineered features for monitoring the integrity and stability of the AIF.

Bases for Selection of Application Contents and Agency Review Guidance

The guidance for Section 4.1 “Principal Design Features” is drawn primarily from NUREG-1199. Although NUREG-1199 identifies eleven “functional requirements” for such design features, the AIF guidance reduces this number to seven, by eliminating those functional requirements that relate to facility closure, stability of waste after closure, inadvertent intrusion, and buffer zones. Thus the following functional requirements were deleted: (6) facilitating site closure and stabilization; (7) minimizing the need for long term maintenance; (8) providing a barrier against inadvertent intrusion; and (11) providing an adequate buffer zone for monitoring and potential mitigative action. Modifications were made to the remaining functional requirements for similar reasons. The related SRP section (NUREG-1200, section 3.1) has been edited to focus on the comparable review criteria and to remove information redundant with NUREG-1199.

4.2 STRUCTURAL DESIGN FOR FOR ASSURED ISOLATION UNITS

Application Contents

The applicant should provide information on the structural design of the assured isolation vaults (AIV), including the description of the loads and load combinations used in the design of the engineered structures; the codes, standards, and specifications used by the applicant in the structural design; the design analytical procedures used and the supporting bases for their selection; the results of the design calculations; the applicant's principal design criteria and the bases for their acceptance; and an assessment of the potential adverse impacts from site factors (e.g., geology, hydrology, and geotechnical characteristics).

Loads and Load Combinations

The information on loads and load combinations should include the types of loads considered in the design, the load combinations used with selected load factors, the choice of design method (e.g., strength design or elastic working stress method), and the important assumptions and factors that affect the allowable limit. For the design of reinforced concrete structures, the strength design method is normally applied; however, to conduct cracking analyses, the working stress method may be used.

For the design of structural steel members, either the elastic working stress method or strength design method are considered applicable.

Applicable Codes, Standards and Regulatory Guidance

The applicant should identify the codes, standards, and regulatory guides used in the structural design of the AIV. The applicant also should identify and describe any deviations and the bases for their acceptance.

Design and Analytical Procedures

The information on design and analytical procedures should include:

1. A description of important structures and their foundations with plans and sectional views;

2. Design assumptions including boundary conditions and the bases for the assumptions;

3. Analytical procedures including computer programs and the method for validating the computer programs;

4. The method for determining the forces resulting from the design-basis earthquake;

5. The results of design calculations and the applicant's procedures for verifying the results

A design report containing design assumptions and calculations should be separately maintained by the applicant in case a structural audit is needed to resolve safety review questions.

Principal Design Criteria

The applicant should identify the principal design criteria and the bases for their acceptance for the structural design aspects that provide reasonable assurance of their contribution to the long-term isolation of the waste in the assured isolation facility. The applicant should describe any deviations from the acceptable codes and standards and provide the technical bases for their acceptance.

Impact of Site Factors

The applicant should describe how specific site factors, that would include geology, seismology, meteorology, climatology, hydrology, and geotechnical and geochemical characteristics, have been considered and addressed in the structural design. The applicant may choose to address the impacts from these site factors in other sections where the siting features are discussed in greater detail, but the applicant would need to cross-reference in this section the section(s) where the impact of site factors on structural design are addressed.

Agency Review Guidance

Loads and Load Combinations

The information on loads and load combinations should demonstrate they are conservatively established. The staff will use as the basis for acceptance the allowable limit, U, for the load combinations in the design of concrete structures. For the design of steel members, the staff will use the allowable limit, S, as the basis for acceptance.

Applicable Codes, Standards and Regulatory Guidance

The staff will review the codes, standards and specifications used by the applicant. Interpretation and use of the listed codes and standards should be conservative and proper. The applicant should describe any deviations from the listed codes and standards and justify the bases for their adoption. The staff will identify inadequately justified deviations as unacceptable and provide the reasons for this determination to the applicant.

Design and Analytical Procedures

The information on the design and analysis of structures and structural systems and components, and the results thereof, should establish they are conservative and representative of good engineering practice.

Principal Design Criteria

The information on the principal design criteria should be clearly identified and demonstrated to result in safe isolation of the waste.

Impacts of Site Factors

The information on the impacts of site factors should clearly define and assess the potential impacts and should show that the site factors will not have any adverse effects on the proposed design and operation of the AIV in meeting the required performance objectives.

Bases for Selection of Application Contents and Agency Review Guidance

The primary source for the Application Contents for Section 4.2 "Structural Design for Assured Isolation Units" is NUREG-1199, Section 3.2A. Section 3.2A discusses the structural design for below-ground vaults (BGV) and earth-mounded concrete bunkers (EMCB). Because this section is applicable to an AIF, it has been incorporated into the Application Contents with minor edits to replace references to "BGV" and "EMCB" with "AIV" (assured isolation vaults). In addition, explicit references to more detailed guidance documents for licensing of disposal facilities (NUREG-1200) have been deleted. An AIF applicant may choose to use such guidance (including codes, standards and design criteria listed in NUREG/CR-5041) as a conservative approach, but all of the criteria in those guidance documents would not necessarily apply to an AIF. References to minimizing the "need for continuing active maintenance" after operations have also been removed. The regulatory review criteria of NUREG-1200, Section 3.2A, are incorporated into the Agency Review Guidance of this section with similar modifications.

4.3 DESIGN CONSIDERATIONS FOR NORMAL AND ABNORMAL/ACCIDENT CONDITIONS

Application Contents

The applicant should present the principal design criteria for the proposed facility. These design criteria should ensure that the principal design features under normal and abnormal conditions are designed to (1) provide safe isolation of the waste, (2) protect public health and safety, and (3) allow active monitoring and surveillance of the facility.

Design criteria should be identified for the structures, systems, and components providing the following seven functions related to the principal design features: (1) minimizing the infiltration of water into assured isolation units; (2) ensuring the integrity of assured isolation units; (3) providing for structural stability of the waste, including any concrete containers, concrete vault roof, and cover or other protective feature; (4) minimizing contact of waste with standing water; (5) providing adequate site surface drainage during operations; (6) maintaining occupational exposures ALARA; and (7) providing adequate site monitoring.

For each function of the principal design features, the applicant should (1) identify and describe the principal design criteria; (2) identify the normal conditions or anticipated occurrences used in design; (3) identify the abnormal conditions used in design; (4) identify the contribution to meeting the performance objectives for each structure, system, and component; and (5) show that the relationship between the principal design criteria and the normal and abnormal conditions will reasonably ensure that the structures, systems, and components will contribute to performance as expected.

Principal design criteria for each functional structure, system, and component under normal and abnormal conditions are discussed in the following paragraphs. Other relevant information on design bases, design limits, and design details (assumptions, methods, calculations, and results) may either be presented in this section or in other sections, depending on where the applicant chooses to provide the required design information.

As appropriate, the short- and long-term stability of the seven principal design features should be analyzed for both static and dynamic loading conditions. For long-term stability considerations (following conclusion of waste acceptance operations), the design-basis abnormal events would include (1) the maximum credible earthquake (MCE); and (2) the probable maximum flood (PMF) resulting from extreme meteorological conditions. For short-term normal operational stability considerations, the loading from the above events would meet with staff approval;

however, less severe natural events would be acceptable, provided the applicant submits information that supports the adoption of the less severe event.

Water Infiltration

Principal design criteria applicable to minimizing the infiltration of water through the cover or other protective feature over the concrete vault roof should identify the fraction of precipitation that can be allowed to infiltrate. The amount of infiltration is estimated based on long-term precipitation records to determine sustained and severe infiltration rates under normal and abnormal conditions. Remedial measures should be described.

Principal design criteria for directing and controlling onsite flood flow or seasonal perch groundwater away from assured isolation units should identify the flow rates and groundwater levels that subsurface drainage system components are expected to handle. These flow rates or groundwater levels at a minimum should be based on (1) the 100-year, 6-hour rainfall with high antecedent moisture conditions as the normal operational event; and (2) either a maximum snowmelt, where applicable, or the probable maximum precipitation (PMP) resulting from extreme meteorological conditions as the abnormal design-basis event.

Isolation Unit Integrity

Principal design criteria applicable to ensuring the integrity of assured isolation unit covers or other protective features and for providing erosion protection, at a minimum, should specify measures for: erosion protection of isolation unit covers; prevention of cover cracking by controlling settlement/subsidence of covers and foundations; and limiting of cracks in the concrete vaults.

Principal design criteria for erosion protection of disposal unit covers or other protective features should, at a minimum, identify (1) surface water and wind velocities used for normal operating conditions and (2) abnormal surface water and wind velocities and water levels for long-term stability considerations.

Principal design criteria to ensure that settlement/subsidence does not affect the integrity of assured isolation unit covers or other protective features, at a minimum, should identify (1) estimated total and differential settlements of the assured isolation units under sustained loads from normal conditions, (2) anticipated strength and durability of the concrete vault and soil cover materials for the operating period, and (3) sustained loads plus ground motion associated with the maximum credible earthquake under abnormal conditions.

Structural Stability

Principal design criteria to ensure the structural stability of the waste, including concrete containers, concrete vault roof, and cover or other protective feature at a minimum, should identify (1) the effects of the design-basis abnormal events on structural stability, and (2) anticipated degradation of cover materials or other protective features and concrete for the operating period in recognition of the geochemical environment.

Contact With Standing Water

Principal design criteria to prevent the contact of waste with standing water during operations, at a minimum, should cover (1) subsurface and surface water drainage away from assured isolation units and temporary storage areas, (2) relative permeability of assured isolation unit floor natural materials to placed drain materials, (3) drainage collection features on or under assured isolation unit floors, and (4) temporary platforms and covers for stored waste exposed to the atmosphere. The design-basis hydrologic and meteorologic events would be identical to the events identified in the section entitled “Water Infiltration."

Site Surface Drainage

Principal design criteria to ensure the safe handling of site surface drainage run-on and run-off should identify (1) site surface drainage features, diversionary structures, and surface drainage slopes and velocities, and (2) the possible effects of upstream dam failures or of water backing up downstream. The design-basis hydrologic and meteorologic events would be identical to the events identified in the section entitled "Water Infiltration."

Occupational Exposure

Principal design criteria to limit occupation exposure, at a minimum, should identify on the basis of (1) ALARA requirements for receiving, inspection, handling, storage, and the assured isolation areas; (2) required shielding for anticipated higher activity wastes; and (3) provisions for handling the accidental rupture of nonstable waste containers.

Site Monitoring

Principal design criteria applicable to site environmental monitoring and surveillance systems should identify (1) the anticipated life of monitoring system equipment and components, (2) potential rate of degradation and action to be taken in the event of loss of the various types of monitoring equipment, and (3) the effects of design-basis abnormal events.

Agency Review Guidance

Principal design features are reviewed under Section 4.1, and auxiliary systems are reviewed under Section 4.4. The actual design of the principal design features may not be addressed under this section if the applicant chooses to provide the required design details in the subsequent sections. However, this section should provide the principal design criteria for all the principal design features of the proposed AIF reviewed under Section 4.1. The regulatory evaluation criteria in this section are to ensure that the applicant's principal design criteria establish the design, testing, and performance requirements for structures, systems, or components that are necessary to provide reasonable assurance that the AIF can be operated to meet the required performance objectives under normal and abnormal conditions. The required safety margin may vary between normal and abnormal conditions. The staff will evaluate the applicant's principal design criteria as discussed in the following sections.

Water Infiltration

The applicant's principal design criteria to minimize water infiltration should support the design related portions of the infiltration analysis reviewed under Section 6.2 and should be consistent with the information reviewed under Sections 4.1 and 4.3 for minimizing water infiltration under long-term sustained and severe precipitation events.

At a minimum, the principal design criteria should (1) be clearly stated, (2) be consistent with the design feature description, (3) be presented for the design of all site subsurface drainage systems and assured isolation unit covers, and (4) identify the amount of precipitation that infiltrates through the covers.

Hydrologic events involving normal and abnormal conditions should be used in the design of surface and subsurface water drainage systems. Normal conditions include a 100-year, 6-hour rainfall with high moisture content. Abnormal conditions include either a maximum snowmelt, where applicable, or the PMP event.

The description of possible remedial measures (such as maintenance) to be performed in the event of increased infiltration during operation should be provided to demonstrate that the intended function of this design feature will be maintained.

Isolation Unit Integrity

The applicant's principal design criteria to ensure the integrity of concrete covers should be consistent with and supportive of the analyses of infiltration reviewed under Section 6.2.

At a minimum, the principal design criteria should (1) be clearly stated and (2) be consistent with the description of the principal design feature reviewed under Section 4.1.

Principal design criteria applicable to ensuring the integrity of the concrete vault roof should, at a minimum, identify erosion protection of isolation unit covers, where utilized, control of settlement/subsidence of the covers and foundation, and limiting of cracks in the concrete vaults.

Principal design criteria for erosion protection of disposal unit covers should, at a minimum, identify (1) surface water and wind velocities used for normal operating conditions and (2) abnormal surface water and wind velocities and water levels used for long-term stability considerations.

Principal design criteria to ensure that settlement and/or subsidence do not affect assured isolation unit cover integrity should at a minimum identify (1) estimated total and differential settlements of the assured isolation structure, (2) anticipated strength and durability of concrete vault and soil cover materials for the operating period, and (3) abnormal ground motion associated with the maximum credible earthquake.

Structural Stability

Principal design criteria to ensure the structural stability of the waste, including concrete containers, vault roof, and cover should be consistent with and supportive of the analysis of slope stability and internal erosion protection of the assured isolation unit covers or other protective feature. These criteria also should address measures for preventing the sliding and overturning of waste canisters or overpacks. Design considerations for the structural stability of engineered assured isolation units are reviewed under Section 4.2.

At a minimum, the principal design criteria should (1) be clearly stated; (2) be consistent with the description of the design feature reviewed under Section 4.1; and (3) be consistent with the information reviewed under Sections 4.2.

Principal design criteria to ensure the structural stability of the waste, including concrete containers, concrete vault roof, and cover or other protective feature should at a minimum identify (1) the effects of the design-basis abnormal events on structural stability; and (2) the anticipated degradation of the cover materials and concrete for the operating period in recognition of the geochemical environment.

Contact With Standing Water

Principal design criteria to prevent contact of waste with standing water should be consistent with the information and should support the analyses reviewed under Section 5.2.

At a minimum, the principal design criteria should (1) be clearly stated; (2) address waste in assured isolation units; (3) be consistent with the description of the design features reviewed under Section 4.1; (4) cover subsurface and surface water drainage away from assured isolation units and temporary storage areas; (5) describe the relative permeability of the assured isolation unit floor natural materials to the placed drain materials and drainage collection features on or under the assured isolation unit floors; and (6) describe temporary platforms and covers to be employed for stored waste exposed to the atmosphere.

Site Surface Drainage

Principal design criteria related to site drainage for safely handling surface water runoff should be consistent with the information and should support the analyses reviewed under "Water Infiltration."

At a minimum, the principal design criteria should (1) be clearly stated; (2) address site surface drainage under operating (waste acceptance period) conditions; (3) be consistent with the description of the design feature in Section 4.1; and (4) cover site surface drainage features, diversionary structures, and surface drainage slopes and velocities.

The design-basis hydrologic and meteorologic events for ensuring site surface drainage are identical to those previously listed in this section for subsurface drainage systems with adequate safety margins for normal and abnormal conditions. Design criteria should address the possible effects of upstream dam failures or backup of water downstream.

Occupational Exposure

Principal design criteria related to occupational exposure should be consistent with the information and should support the analyses reviewed under Sections 5.1, 5.2, and Chapter 7.

At a minimum, the principal design criteria should (1) be clearly stated and (2) be consistent with the description of the design feature reviewed under Section 4.1.

Principal design criteria to limit occupational exposure should identify (1) ALARA requirements for receiving, inspection, handling, storage, and assured isolation areas; (2) required shielding for

anticipated higher activity wastes; and (3) provisions for handling the accidental rupture of nonstable waste containers.

Site Monitoring

At a minimum, the principal design criteria should (1) be clearly stated and (2) be consistent with the description of the design feature reviewed under Section 4.1.

Principal design criteria for site monitoring systems should identify the (1) anticipated life of monitoring system equipment and components, (2) potential rate of degradation and actions to be taken in the event of loss of the various types of monitoring equipment, and (3) the effects of design-basis abnormal events on site monitoring systems.

Bases for Selection of Application Contents and Agency Review Guidance

The primary source for the Application Contents for Section 4.3 "Design Considerations for Normal and Abnormal/Accident Conditions" is NUREG-1199. Requirements and terminology specific to a traditional LLW disposal facility have been removed or edited to be more representative of requirements for an AIF application. References to "disposal" units were modified to "assured isolation" units and references to closure activities, inadvertent intruder barriers, and methods minimizing the need for long-term maintenance have been excluded from this section since they are not relevant to an AIF. Since covers, or other protective features, and concrete vaults will be used to protect the assured isolation units, the focus of the structural stability requirements has been changed to address the long-term degradation of the concrete vault roof. The concrete vault roof is assumed to remain intact for the life of the AIF due to continual surveillance and maintenance. Any potential water infiltrating the assured isolation units is assumed to occur through microfractures in the concrete structure. Also, the primary emphasis on requirements for settlement and differential settlement has shifted toward the assured isolation structure instead of the waste and fill materials. The regulatory review criteria of NUREG-1200, section 3.2, has been incorporated into the Agency Review Guidance of this section with similar editorial modifications.

The accident conditions are not considered as design criteria because any accident event can be resolved during operations associated with active maintenance.

The "probable maximum earthquake" has been replaced with the less conservative criterion MCE in the design of the AIF. However, this new criterion still provides a safety margin

significantly greater than the design requirements of conventional nuclear-related structures, and is considered to be acceptable.

4.4 DESIGN OF AUXILIARY SYSTEMS AND FACILITIES

Application Contents

Utility Systems

The applicant should describe the utility systems of the proposed facility, how each system provides support required by the operational needs of the proposed facility, and any adverse effects that the utility system design or potential failure could have on overall facility performance.

The applicant should describe all utility systems including communication, electric, water, lighting, sanitary waste disposal, fuel delivery, and any other utility system installed at the facility. The following information should be provided for each system: (1) an accurate description of system components; (2) an identification of which functional requirements of the principal design features in Section 4.1, if any, are supported; (3) design bases, criteria, codes, and standards used for design; and (4) any potential adverse effects on principal design features or overall facility performance that might result from failure of the utility system.

Auxiliary Facilities

The applicant should describe the auxiliary facilities of the proposed facility, how the auxiliary facilities support the operational needs of the facility, and any adverse effects that the auxiliary facility design or failure could have on overall facility performance.

The applicant should describe the auxiliary buildings required to support operation of the facility and should present (1) the overall layout and design of auxiliary buildings; (2) the purpose for each building; (3) design criteria, codes, and standards used in design; and (4) potential adverse effects of building design or building failure on the overall facility performance.

The applicant should describe the traffic systems required to support operation of the facility, and should include (1) the overall traffic system design including layouts of roadways and/or railways, (2) the purpose of the traffic system components, (3) the materials used in construction, (4) traffic controls, and (5) potential adverse effects of traffic system design or component failure on overall facility performance.

The applicant should describe any auxiliary facility that is in addition to buildings and traffic systems and identify any potential adverse effects that its design or failure could have on overall facility performance.

Fire Protection System

The applicant should describe the fire protection system and the system's capability to safely protect the facility and workers from radiation and fire hazards if any accidental fire should occur. The fire protection system includes the equipment, procedures, training, management, and emergency planning required for fire protection at the facility.

The applicant should postulate accidental fire scenarios and describe the potential consequences of the accidental fires where the postulated fires could occur in areas important to radiological safety such as the waste receipt area, the waste handling area, and the waste isolation area. Both normal operating and abnormal and/or accident conditions should be considered in the postulation and analysis of accidental fires. The fire analysis should include the locations of the fire assumed to produce the severest conditions, the construction arrangement of affected structures, the materials likely to be consumed, and the safety and health effects of the smoke and heat associated with the fire.

The applicant should describe (1) the management's plan for responding to a fire emergency; (2) the procedures, materials, and equipment that will be in place for use during a fire emergency; (3) the procedures and equipment for providing offsite alarms, if required; and (4) the training programs for facility personnel both for the prevention of fires and for responding to fire emergencies. The applicant should show how the prescribed provisions and recommendations of National Fire Protection Association Codes, NFPA 801 latest edition, "Recommended Fire Protection Practice for Facilities Handling Radioactive Materials," and NFPA 901 latest edition, "Uniform Coding for Fire Protection," have been implemented in the fire protection system proposed for the facility.

The applicant should describe the equipment to be used in preventing and responding to fires and should include building materials; fire detection equipment; sprinklers; onsite and offsite alarm systems; wet, dry, and chemical fire extinguishers; and foam extinguishing systems.

The applicant should describe the emergency response to a fire by facility personnel, the provisions for notification of the public of potential radiological hazards, and the evacuation measures for facility personnel and nearby residents, if these measures are required.

Erosion and Flood Control System

The applicant should provide hydrologic analyses and design details of the site flood control system. Those features that will provide protection against erosion and flooding during the operational period should be fully described. The information and analyses should conclusively document that surface features have been designed to direct surface drainage away from assured isolation vaults at velocities and gradients that will not result in flooding or erosion.

The applicant should provide detailed descriptions (plans, maps, and cross-sections) of the site drainage system, including channels, erosion protection, and diversion structures. The applicant should also provide detailed computations of peak flood flows, depths of flow, and velocities that constitute the bases for the design of protective features. Estimates of rainfall intensity, infiltration rates, times of concentration, hydrographs, etc., should be provided in sufficient detail to allow independent evaluations to be made of the design criteria and technical analyses.

Agency Review Guidance

Utility Systems

Communication System

The communication system should: (1) provide clear communication, either visual or sound, between plant personnel at all times during waste receipt, handling, and isolation operations; (2) provide a reliable link with offsite officials, particularly during a period of emergency response; (3) be constructed according to common and accepted practice; and (4) not interfere with the design or operation of the facility.

Electric System

The electric system should: (1) provide onsite power as required to safely operate the facility; and (2) be constructed according to common and accepted practice.

Water System

The water system should: (1) provide adequate volumes of water for construction, operation, and fire fighting as required to safely operate the facility; (2) be installed according to common and accepted practice; (3) provide potable water for workers; and (4) provide warm water for the decontamination of workers.

Lighting Systems

The lighting system should: (1) provide adequate lighting as required to safely operate the facility; (2) provide emergency lighting as required for anticipated accident scenarios; and (3) be constructed according to common and accepted practice.

Sanitary Waste Disposal System

The sanitary waste disposal system should: (1) be adequately sized for its anticipated usage; (2) meet applicable State and local codes and standards; and (3) not interfere with the design and safe operation of the facility.

Fuel Delivery System

The fuel delivery system should: (1) provide adequate fuel for the onsite building equipment and isolation activities; (2) result in isolation of accidental fires, if they were to occur; (3) meet or exceed the standards of common and accepted practice; and (4) not interfere with the design or operation of the facility.

Other Utility Systems

Any other utility system that may be required for the safe operation of the proposed facility should: (1) be adequately sized for the proposed design; (2) be constructed according to common and accepted practice; and (3) not interfere with the design or operation of the facility.

Auxiliary Facilities

Auxiliary buildings should: (1) support operations at the facility; (2) be constructed in accordance with applicable and appropriate Federal, State, and local building codes and industry standards; (3) perform safely under loading imposed by normal design-basis events anticipated during the operational life of the facility; and (4) not interfere with operations at the facility, including planned decontamination and decommissioning activities.

Roadway Layout and Traffic Controls

The information on the roadway layout and traffic controls should demonstrate that the proposed traffic system will support and not adversely affect safe operation of the facility. The traffic controls should follow applicable industry standards, and the roadways should be of sufficient dimensions to allow for safe movement of facility equipment and vehicles. The layout should be

designed so that environmental and site monitoring and remedial actions that may have to be undertaken will not be affected.

The information on roadway characteristics should demonstrate that the proposed roadways will support and not adversely affect safe operation of the facility. The roadway materials should be sufficiently durable to handle traffic loads expected during operations without deterioration and should follow applicable and accepted industry standards.

Fire Protection System

Accidental Fire Analysis

The information on the accidental fire analysis should demonstrate that fires and their effects in the presence of radioactive substances are postulated for the waste receipt area, the waste storage area, and the waste isolation area, at a minimum. The analysis should consider the location where the most severe fire could occur, the materials likely to be consumed, the construction arrangement of any buildings or areas likely to be consumed, and the harmful effects of smoke and heat associated with the fire.

Fire Protection System

The information on the fire protection system should demonstrate that (1) the procedures, materials, equipment, and systems for fire protection will protect workers and the public from radiation and fire hazards, (2) there is a suitable program for the prevention of hazards from radiation and fire, and (3) there is a program to adequately train facility personnel to respond to fire emergencies and to prevent fires. The methods proposed to provide this system should meet the prescribed recommendations in NFPA 801, latest edition and NFPA 901, latest edition, including the referenced recommended practices, especially in regard to the equipment for the detection of fires; equipment for the prevention of fire hazards (sprinklers, etc.); onsite and offsite alarm systems; wet, dry, and chemical fire extinguishers; foam-extinguishing systems; personnel training; building materials; and facilities handling radioactive wastes. Buildings on site should meet the requirements of the Uniform Fire Code for their intended purposes, especially the waste receipt and storage areas, the vehicle wash down facility, and the waste repackaging areas.

Emergency Response

The emergency response plan should contain adequate measures for the notification and evacuation of workers and nearby residents if a fire should occur.

Erosion and Flood Control System

A thorough evaluation of the surface water flooding and erosion protection aspects of the site design and the basic data and analyses supporting all conclusions are necessary. Criteria relevant to an assessment of the acceptability of information, data, and analyses submitted pertinent to each area of the review are listed in the following sections.

Hydrologic Description of Site

Acceptance is based on a qualitative evaluation of the completeness and quality of information, data, and maps. The description of structures, facilities, and erosion protection designs is sufficiently complete if it allows independent evaluation of the effects of flooding and intense rainfall. Site topographic maps are acceptable if they are of good quality and of sufficient scale to allow independent staff analysis of pre and post-construction drainage patterns.

Flooding Determinations

Because of the risks associated with the flooding and/or release of LLW during the period when wastes may not be covered or protected, the PMF and the PMP provide acceptable bases for the design of flood protection features. Although use of the PMF is clearly acceptable for the operational design of low-level waste facilities, its use is not required. On a case-by-case basis, the staff will review site designs that are based on floods less than a PMF. The acceptability of using such floods must be documented by the applicant. The analyses must conclusively document the integrity of the site, particularly in light of the uncertainties associated with the magnitude and occurrence of rare floods.

The PMF is defined in American National Standards Institute/American Nuclear Society Standard ANSI/ANS 2.8 latest edition, and should be estimated for all adjacent streams, rivers, and site drainage channels.

The staff will review the applicant's analyses pertinent to the identification of the design-basis-flood magnitudes, levels, and velocities. Acceptance is based on general agreement of the staff's and the applicant's estimates of static flood level and peak discharges and the adequacy of the computational methods used for such estimates.

Dam Failures

The staff will review the applicant's assessment of peak water levels, flood routing procedures, and flood velocities associated with floods resulting from dam failures due to either seismic or hydrologic causes. A conclusion (from an existing analysis) that seismic or hydrologic events

will not cause failures of upstream dams that could produce the governing flood at the site may be acceptable if available information supports such a conclusion (e.g., record of contact with dam designers). In general, the staff will review the following specific analyses:

1. Conservatism of modes of assumed dam failure (break configuration, duration of flow, etc.);

2. Conservatism of downstream flow rates and levels;

3. Consideration of storage capacity of flood control reservoirs;

4. Flood wave attenuation to downstream dams or to the site;

5. Potential for multiple upstream dam failures and resultant flood wave effects.

Flood Control Designs

Flood control features should be either (1) capable of preventing erosion and flooding of isolation units or (2) designed so that inundation does not result in the release of wastes from the isolation area. In general, flood control measures that are designed to accommodate an occurrence of the PMP or PMF provide an acceptable design. If the design assumptions and calculations are conservative, reasonable, and accurate and/or compare favorably with independent staff estimates, the designs are found to be acceptable.

Bases for Selection of Application Contents and Agency Review Guidance

The primary sources for Section 4.4 "Design of Auxiliary Systems and Facilities" are NUREG-1199 and NUREG-1200. Edits were made to delete references to "disposal," and to add references to "isolation," remove references to closure and stabilization, and add references to decontamination and decommissioning activities. NUREG-1200 was also edited to focus on key regulatory review criteria and to remove information redundant with NUREG-1199.

5.1 RECEIPT AND INSPECTION OF WASTE

Application Contents

The applicant should describe the procedures in place that will ensure that arriving shipments comply with applicable Federal regulations and waste acceptance criteria that might be incorporated into the facility license as conditions. These regulations and acceptance criteria should govern the acceptability of waste packages for routine handling operations, isolation, and for potential, future disposal.

Specifically, information on the following procedures should be provided:

1. Procedures for visual examination of the shipping documents, including any required compliance certificates and the waste manifest required by 10 CFR § 20.2006;

2. Procedures for visual examination of the waste package to ascertain if there are any irregularities in markings, labels, or probable waste contents and if the package is correctly described on the waste manifest as to its size, type, and waste contents; visual procedures in place to ensure that the "routine determinations" required by 10 CFR § 71.87 are met;

3. Procedures to ensure verification surveys of the non-fixed (removable) radioactive contamination on the external surfaces of packages as required by 10 CFR § 71.87 and 49 CFR § 173.443 and procedures to verify that the external radiation levels around waste packages and transporting vehicles are within the limits of 10 CFR §71.47 and 49 CFR § 173.441;

4. Procedures and information on testing and test equipment to be used to verify the accuracy of the waste class reported on the waste manifest; (These procedures should include a proposed frequency for performing waste classification testing.)

5. Procedures and information on testing and test equipment to be used to analytically verify that waste characteristics and waste form requirements are met and that the waste contains no hazardous constituents as determined by U.S. Environmental Protection Agency regulation 40 CFR Part 261; (These procedures should include a proposed frequency for performing waste form testing.)

6. Other procedures required to ensure that all waste acceptance criteria are met.

Agency Review Guidance

The purpose of this review is to establish that waste receipt and inspection are adequately described. The applicant should demonstrate that arriving shipments comply with Federal regulations and acceptance criteria that might be incorporated into the facility license.

For receipt and inspection of waste, the NRC staff will determine if the applicant has adequate procedures in place to ensure that arriving shipments are in compliance with applicable Federal regulations and waste acceptance criteria that might be incorporated in the facility license as conditions. These regulations and acceptance criteria govern the acceptability of waste packages for routine handling operations. The staff also will determine if the applicant's procedures are adequate to verify, on the basis of sampling, the classification and characteristics of waste entering the facility. The applicant's ability and objective of protecting individuals during operations are of primary importance. In addition to ensuring conformance with applicable regulations, the staff will review the applicant's procedures to determine the applicant's ability and commitment to identify and respond to waste packages requiring remediation. Waste not in compliance with regulations and license conditions should be prohibited from entering the facility.

Evaluation criteria pertaining to particular areas of review relevant to receipt and inspection are given below.

Examination of shipping documents

The applicant's procedures should: (1) provide reasonable assurance (for example, through the use of checklists) that NRC and DOT waste manifest information requirements are met; and (2) require written certification by a knowledgeable and responsible individual (such as the radiation safety officer (RSO) or the RSO's authorized representative) that such information has been provided on the manifest as required by 10 CFR § 20.2006.

Visual check of the waste package

The applicant's procedures should provide for (for example, through the use of checklists) examination of the waste package for its integrity and conformance with DOT packaging requirements for shippers. Package markings, labels, probable waste contents (as evidenced by the type of package), and the waste manifest should correctly describe the size, type, and waste contents of the package. The procedures for visual inspection should determine that the "routine determinations" of 10 CFR § 71.87(a) through (h) are satisfied. These procedures should include: (1) requiring written certification by a person of reasonable knowledge and authority;

and (2) reporting requirements for waste packages found to be in noncompliance and requirements for the disposition of these items.

Survey for non-fixed (removable) contamination and external radiation levels

The applicant's procedures should contain methods for determining non-fixed (removable) contamination and external radiation levels in the most appropriate locations as required by 10 CFR § 71.87. The non-fixed levels determined by taking smear samples should be compared with the maximum permissible limits of 10 CFR § 71.87. Procedures describing disposition of packages having non-fixed (removable) contamination above the maximum permissible limits should be in place. The external radiation levels around the package and around the vehicle should be compared with the limits specified in 10 CFR § 71.47, "External Radiation Standards for all Packages." The disposition of waste packages, or vehicles, or both, exceeding the limits specified in 10 CFR § 71.47 should be described in the applicant's procedures. Written certification should be required from a person of reasonable knowledge and authority (such as the RSO or the RSO's authorized representative), and reporting requirements should be mandatory for measurements that do not meet the limits prescribed in the regulations cited above.

Verification of waste classification

The applicant's procedures should meet the following conditions:

1. The applicant has access to equipment or facilities capable of performing the waste classification determinations required by 10 CFR § 20.2006 and 10 CFR § 61.55.

2. The analytical procedures and equipment demonstrate the applicant's capability to periodically perform, or have performed on the applicant's behalf, quantitative determinations for the waste generator in "Technical Position on Waste Classification for 10 CFR Part 61."

3. The applicant's procedures, equipment, or vendor service should be capable of confirming the absence of significant chemicals in the waste, in particular those chemicals exhibiting a hazardous characteristic (see 40 CFR Part 261, Subpart C) or listed as hazardous (see 40 CFR Part 261, Subpart D) by the U.S. Environmental Protection Agency. The applicant should characterize the chemical constituents of the waste form to ensure that no materials are included in a low level waste package that are specifically excluded by regulation (40 CFR Part 261, Subpart A) from being disposed of in a facility licensed solely pursuant to the Atomic Energy Act of 1954, as amended, or by operational consideration from being disposed of with such waste.

The chemical characterization of heterogeneous solid wastes by traditional analytical techniques is extremely difficult to accomplish with any acceptable degree of confidence because of the diversity and variable time dependence of most waste streams and sampling methods. Thus, when such techniques are used, they must be reproducible and valid and must have a known associated uncertainty. Consequently, much of the chemical characterization activity for waste will depend upon process knowledge, using relative concentrations and quantities in an analysis of the waste generation process, and will depend primarily upon data from the waste generator.

Verification of minimum waste form and stability requirements

The applicant's procedures and equipment should provide for tests to be performed for all waste classes as follows:

1. Solidified Class A Segregated Waste Products

   These procedures should, as a minimum, allow identification of the wastes as a freestanding monolith and provide assurance that the waste has less than 0.5 percent freestanding liquid.

2. Solidified Class A Waste Co-mingled with Stable Class B and Class C Waste

   a. Procedures should, as a minimum, provide for the verification of the structural stability including compressive strength following immersion testing of cored, solidified waste specimens.

   b. Class A solidified waste should have less than 0.5 percent freestanding liquid by volume of the waste and should be solidified completely.

3. Solidified Class B and C Waste

   These wastes should have demonstrated structural stability and be tested as in (2) above.

4. High-Integrity Containers

   a. The maximum free liquid in a high-integrity container (HIC) should be less than 1 percent of the waste volume.

b. Procedures should include methods for verifying that specific HIC materials comply with HIC certificates of compliance. They should also include methods to verify that the HIC design is appropriate for any anticipated corrosive and chemical effects of the AIF environment by acknowledging that site parameters are within the design parameters established in the certificate.

Identification of packages requiring remediation

The procedures should demonstrate that the following types of waste can be identified and made safe:

1. Waste that does not meet the DOT's external radiation or surface contamination levels;

2. Waste that is not packaged properly;

3. Waste containing unacceptable materials including hazardous, biological, and pathogenic material;

4. Waste that exceeds the maximum allowable activity levels and concentrations for specific radionuclides;

5. Waste that does not meet the applicable waste form requirements;

6. Waste that does not carry the proper manifest (e.g., waste whose manifest whose manifest does not contain information required for identification of major constituents or pertinent information on the identification of the person(s) shipping the waste), or is found to have characteristics inconsistent with the manifest provided.

Disposition of unacceptable packages

The staff should verify that the applicant has procedures in place to handle waste packages that are not acceptable for isolation at the AIF and that cannot be remediated on site.

Records and reports

The applicant's procedures should implement the requirements of 10 CFR § 61.80(f) and Appendix G to 10 CFR Part 20 for maintaining records and issuing reports.

Bases for Selection of Application Contents and Agency Review Guidance

The primary sources for Section 5.1 “Receipt and Inspection of Waste” are NUREG-1199 and NUREG-1200. Waste manifesting, characteristic, classification, and labeling criteria are included because they are considered appropriate and necessary as a means of assuring proper identification of waste for the reasons discussed in Volume 1, Sections IV.B.6-8.

5.2 WASTE HANDLING AND ISOLATION

Application Contents

The applicant should provide information on the waste handling and isolation operations to be performed at the facility following acceptance and receipt of the waste packages. The applicant should describe the operations in sufficient detail to demonstrate that the waste will be handled safely and isolated in a manner that will prevent contact of water with the waste. Waste handling information to be provided should include the procedures and equipment that will be used to move the waste from the area of receipt to the isolation location. Waste isolation information to be provided should include the buildings, restricted areas, procedures, and equipment that will be used to isolate waste after receipt.

The information on waste handling should include procedures to protect facility workers during handling (training to ensure safe radiological control, decontamination provisions, use of protective clothing, etc.) and a description of the handling operations (off-loading procedures, anticipated rigging for the various types and sizes of containers, unloading equipment, etc.) The description of handling procedures should cover contingency plans for damaged waste packages and proposed procedures for repackaging.

Information on isolation should include the applicant's procedures for maintaining a log and inventory with appropriate radiological monitoring provisions to ensure that any applicable limits were not exceeded. The applicant should describe the isolation locations and facilities and the measures to be used to protect the waste from precipitation and adverse weather conditions.

The information on waste placement should include the operations and procedures for actually placing Class A, Class B, and Class C wastes in the AIF. This information should identify the specific equipment to be used to place the waste while maintaining the integrity of waste packages, including the use of slings, pallets, or special unhooking mechanisms to minimize worker exposure during placement. A description of the procedures for controlled placement and stacking should be provided. The methods to protect facility workers from exposure (shielding, protective clothing, etc.) during placement should be described. Information on the operations for placing Class C waste is of special importance.

Agency Review Guidance

The purpose of this review is to establish that waste handling and isolation activities are adequately described. The applicant should demonstrate that handling activities, placement of waste, and isolation activities are conducted safely.

For waste handling and isolation the staff will review the information to ensure that the waste will be handled safely following receipt at the facility. Additionally, the review is to ensure that the isolation provided will be carried out in a safe manner and in a way that will prevent contact of water with the stored waste. Procedures, buildings, and equipment that will be used to store waste after receipt for a short time -- essentially for staging purposes -- before placement in vaults should be described.

Evaluation criteria pertaining to particular areas of review relevant to waste handling and isolation are given below.

Waste handling

The information on waste handling should demonstrate that the procedures proposed provide for the proper handling of Class A, Class B, and Class C wastes at all times. The proposed procedures should provide for the protection of workers during all phases of handling with special emphasis on the procedures when handling wastes that present a significant radiological or physical hazard. Handling procedures should contain contingency plans for damaged packages and propose repackaging procedures. Equipment to be used should meet industry standards and have the capability to permit safe handling of waste and to carry out its intended design functions.

Isolation including short-term storage

The information on short-term storage of waste should demonstrate that the procedures proposed result in the use of dedicated short-term storage space -- essentially for staging purposes before placement in vaults -- when necessary, the efficient use of storage space, and the placement of waste into vaults for long-term isolation as soon as possible after receipt. The proposed isolation system is acceptable if the waste, buildings, and equipment will be protected from the adverse effects of precipitation, and waste will be protected from contact with surface water. Equipment to be used should meet industry standards and be installed to meet the intended safety functions of the AIF. Criteria for short-term storage should reflect the need for prompt placement of waste material in vaults for long-term isolation. Procedures should address the maintenance of waste package integrity that is consistent with isolation requirements. Complete and accurate information concerning the cover material placed on top of vaults is required and adequate if it is

evaluated to be stable and sufficient to protect the vaults from freeze and thaw cycles. Information demonstrating the placement of durable surface markers identifying the underground boundaries of covered vaults should also be provided. Information provided on waste placement should demonstrate that the procedures, processes and equipment ensure that all classes of waste will be placed in their proper locations at all times in a manner that will maintain package integrity and protect facility workers from exposure. Procedures should include information on personnel protection during the placement of wastes, especially Class C wastes. Equipment should meet industry standards and be operated safely according to commonly accepted industry procedures.

Combined handling and isolation considerations

The information provided by the applicant for combined handling and isolation considerations for waste should (1) provide adequate rationale for equipment and staffing requirements for waste handling and isolation, (2) provide a realistic assessment of waste quantities and subsequent disposition during the handling, storage, and isolation of waste, (3) provide a realistic assessment of worker exposure during waste handling, storage, and isolation and provide procedures to maintain such exposures ALARA, (4) provide an adequate rationale for methods of handling fissile materials, and (5) provide an adequate basis for the release of transport vehicles offsite following off-loading and, if necessary, vehicle decontamination.

Bases for Selection of Application Contents and Agency Review Guidance

The primary sources for Section 5.2 “Waste Handling and Isolation” are NUREG-1199 and NUREG-1200. Handling and placement requirements applicable to a disposal facility have been specified because of their relevance to an AIF facility and satisfying radiation protection standards. Certain surface location marking criteria are also prescribed since -- although the AIF is not a near-surface disposal facility -- vaults will be covered with earth. Surface indication of the location of the covered concrete vaults is considered appropriate. References to “segregation” of class A, B, and C wastes have been deleted because they are not required for an AIF.

5.3 OPERATIONAL ENVIRONMENTAL MONITORING AND SURVEILLANCE

Application Contents

The information in this section should demonstrate how the applicant meets the environmental monitoring and surveillance requirements of 10 CFR Part 20. The applicant should:

1. Submit monitoring plans that provide adequate data for evaluation of the potential long-term health and environmental effects resulting from accidental or routine exposure conditions.

2. Describe the extent of its participation in an environmental laboratory intercomparison program (such as that administered by the U. S. Environmental Protection Agency). This will provide the staff with some measure of both the precision and accuracy of the laboratory measurements of radioactivity. If these analyses are to be performed by an outside contractor, a description of the contractor's quality assurance (QA) program and the extent of the contractor's participation in a nationally recognized laboratory measurements intercomparison program should also be included.

3. Describe how the monitoring system is capable of providing early warning for releases of radionuclides from the facility. The rationale for the selection of recording levels, action levels, and the concentrations in each medium that lead to mitigative action should be discussed in detail.

4. Describe and document the mathematical/computer models to be used for calculation of dose to workers onsite and the public offsite when the measured concentrations of pollutants are below the limits of detection by state-of-the-art instrumentation.

5. Define those protective and restorative actions to be taken if an unplanned release of pollutants were to occur from the site. The plan should be based on the protective action guides developed by the U.S. Environmental Protection Agency (EPA).

Agency Review Guidance

The purpose of this review is to establish that operational monitoring and surveillance activities, are adequately described. The applicant should demonstrate that the environmental monitoring activities meet applicable requirements.

For operational environmental monitoring and surveillance the staff will evaluate how well the applicant's proposed monitoring program provides reasonable assurance that applicable sections of 10 CFR Part 20 are satisfied.

In addition, the program should provide data for the evaluation of health and environmental effects, provide early warning of the release of radionuclides from the facility, and enable the evaluation of the need for mitigative measures.

Evaluation criteria pertaining to areas of review relevant to environmental monitoring and surveillance are presented below.

Description of operational environmental monitoring program

The description should include (1) a justification for the selection of specific media to be monitored; (2) the choice of sampling locations (onsite as well as offsite); (3) the type, number, and methods of collection; (4) the collection frequency; (5) pre-analysis treatment; (6) analytical instrumentation and analyses; and (7) minimum sensitivities. The description of the monitoring program should also show that special program features have been considered, such as analyses for specific radionuclides or other contaminants, because of pre-existing site-specific parameters or conditions.

Environmental information that the staff's review will usually include is as follows:

1. Site-specific radiation measurements and radionuclide concentrations including such radiological parameters as:

    a. Ambient radiation levels (taken at 1 m above the ground surface) at a number of locations within 10 km of the site as well as in the nearest residential community or city of 10,000 or more population within 50 km of the site;

    b. Concentrations of the major naturally occurring radionuclides (e.g., uranium, thorium, and potassium) in applicable environmental media (e.g., air, water, soil, and biota);

c. Concentrations of the major fallout radionuclides (e.g., strontium, cesium, and plutonium) or appropriate radionuclides that could be included as emissions from other nearby (within 50 km) nuclear installations in applicable environmental media (e.g., air, water, soil, and biota);

d. Concentrations of the radionuclides expected to be included in the isolated waste.

2. Descriptions of the preexisting (i.e., contaminated) site environment and sources of contamination that may affect local air, soil, or water quality or the monitoring programs.

Equipment, instrumentation, and facilities

The determination of acceptability is based on the survey requirements of 10 CFR § 20.1501 and on a comparison of the applicant's implementation of the guidance in Reg. Guides 8.6, 8.21 and 8.25; and the following guidelines.

The analytical laboratory should be equipped to perform the routine analyses required on environmental samples for both radiological and nonradiological constituents. Instruments and monitoring devices for field surveys and field sampling should have appropriate range, accuracy, and sensitivity to adequately measure direct radiation and to monitor relevant radiological and nonradiological constituents to be encountered during routine operations. The analytical capabilities should be adequate to detect specific radiological and nonradiological indicators (e.g., tritium, radioiodine, trace metals, total organic carbon, and pH).

Instruments and equipment for measuring levels of radiation (or concentrations of radioactivity) present normally should include the following:

1. Direct radiation monitoring -- Geiger-Müller meters, micro-R meters, gamma spectrometers, a high-pressure ionization chamber, and thermoluminescent dosimeters;

2. Radiochemical analyses -- Multichannel gamma pulse height analyzer, low-background alpha-beta proportional counter, gamma and alpha-beta scintillation counter, and end-window Geiger-Müller counter.

The information provided by the applicant should address inspection, calibration, maintenance, and repair of the monitoring equipment. The environmental monitoring program support facilities should include, as a minimum, controlled storage areas for instruments and equipment,

a controlled area for the calibration of instruments, and facilities to clean, repair, and decontaminate monitoring equipment and instrumentation.

Field sampling equipment and the instruments for measuring nonradiological parameters should normally include the following, in addition to sample containers, labels, and chain-of-custody and data recording forms:

1. *Air sampling* -- Air samplers with particulate filters and charcoal canisters;

2. *Water sampling* -- Specific ion probes, various types of pumps (e.g., submersible or air powered); flow-through measurement cells; flow-through filters; pH, Eh, and specific conductivity meters; water level indicators; and equipment for field measurements;

3. *Soil and sediment sampling* -- Top soil cutters, augers, knives, and rubber mallets;

4. *Vegetation and other biota sampling* -- Cutters, knives, and devices for capturing animals.

Data recording and statistical analysis

Data should be recorded in appropriate units (mrem, mrad, pCi) and expressed with an appropriate number of significant figures. Unambiguous overall estimates of the uncertainties associated with the measurements of radioactivity and radioactive concentrations should be provided. The applicant should implement the guidance in Reg. Guide 8.25 and the following guidance.

Reported measurement results should include descriptive statistics (i.e., measured or calculated values, sample size, mean, standard deviation, overall uncertainty, confidence interval for the mean, etc.). The applicant should adequately estimate the statistical validity of the sampling program. Statistical consideration should be given to the number and distribution of sampling locations, the frequency and number of sample collections, the number of analyses per sample, and the frequency of sample analyses.

Organization

The information on the administrative organization for the monitoring program include (1) the lines of authority, (2) the qualifications of the technical personnel, and (3) a description of the staff training program. The organization should meet the criteria of Reg. Guide 8.2.

Quality assurance and quality control

The QA and quality control (QC) procedures should be adequate to ensure the accuracy and validity of the monitoring program. Components of a QA/QC program should include the following: record keeping, audits, quality control on field and laboratory measurements (e.g., source checks, calibration standards, instrument calibration procedures, written operational procedures for the use of instruments, sample collection, sample processing, and radioanlytical analyses), personnel training, and quality control on the maintenance and calibration of instruments. The staff's determination of acceptability is based primarily on a comparison with the criteria in Reg. Guide 4.15.

Bases for Selection of Application Contents and Agency Review Guidance

The primary sources for Section 5.3 "Operational Environmental Monitoring and Surveillance" are NUREG-1199 and NUREG-1200. Requirements pertinent to long-term post-closure performance have not been included because the AIF is not a near-surface disposal facility and will not be initially licensed as such. In addition, references to detailed guidance, such as ANSI standards, have not been included because they are generally beyond the scope of this report. Such guidance may, however, be of use in the actual preparation of an AIF license application. Accordingly, the preparer of an application may want to consult NUREG-1200 for reference to additional guidance documents.

6.1 DETERMINATION OF TYPES, KINDS AND QUANTITIES OF WASTE

Application Contents

The applicant should supply detailed projections of the quantities and physical, chemical, and radiological characteristics of the low-level wastes to be received and isolated at the AIF. The applicant should provide sufficient information on the wastes projected to be received and isolated to allow for defensible modeling of potential radiological impacts associated with waste isolation and also to allow for determination of the applicant's plans to ensure sufficient availability of funds for decontamination and decommissioning.

At a minimum, the following information on waste characteristics should be provided:

1. Identification of the locations from which waste is expected to be received;

2. A discussion of the potential for receipt of waste from locations other than those from which it is expected, as well as any conditions for such waste receipt;

3. An identification of the major individual waste streams that constitute the majority of the waste volume and activity; (These waste streams should furthermore be identified in terms of specific waste-generating facilities, e.g., activated metals from a particular nuclear power plant.)

4. An identification of the waste streams that constitute the remaining waste volume and activity; (These waste streams may be identified in terms of typical waste streams generated by a number of generators, e.g., a waste stream consisting of low-activity trash generated by all hospitals in identified locations.)

5. Information on the physical, chemical, and radiological characteristics of each waste stream so identified in items 3 and 4 above; (At a minimum this information should include (a) annual volumes, (b) waste class, (c) average concentrations of the principal radionuclides constituting the waste stream [including those listed in 10 CFR § 61.55], (d) the chemical and physical form, (e) the presence of chelating agents, (f) packaging characteristics, and (g) solidification agent. Descriptions of the chemical and physical form should provide information important to an estimation of release rates, e.g., whether the waste stream consists of activated metals, sealed sources, and ion-exchange resins.)

6. For the information discussed above on waste volumes, an estimate of trends, for example, whether the waste stream will be generated at a constant annual rate, or only occasionally; (Waste streams expected to be generated only in the future, e.g., waste streams associated with decommissioning of a nuclear power plant, should be specifically identified.)

7. For major generators, any plans to alter waste generation rates, e.g., changes in volume reduction, decommissioning plans, over the first 5 years of the operational life of the AIF;

8. A presentation and discussion of any limitations that will be imposed on waste receipt, form, packaging, or other characteristics that would influence doses resulting from AIF operation; (Such limitations could potentially include limitations on total site inventories of radionuclides of concern, e.g., C-14 and H-3, or requirements on the structural stability of certain Class A wastes. These proposed limitations will be incorporated into facility licenses as conditions of operation.)

9. A summary of the total projected waste volume and activity for each year of the facility's operational life.

Agency Review Guidance

The staff should review the applicant's projections of low-level wastes expected to be delivered to the facility over its operational life. The staff's assessment of the adequacy of the projections should be principally based on past waste-generating history. Waste generated by each of the most significant generating facilities should be reviewed, and major discrepancies between the past and projected future generation rates should be clarified with the applicant. The staff should also consider contacting the principal generators directly for confirmation of current and future waste-generating plans. If a facility is not yet generating waste (e.g., a nuclear power plant is still under construction at the time of the application), then the staff should refer to generic estimates of waste generation. This could include information obtained from NRC NUREG reports or other sources.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 6.1 "Determination of Types, Kinds and Quantities of Waste." While NUREG-1199 requests the applicant to provide waste projections during both the "operational" period and for waste "generated as part of closure activities," this guidance does not include criteria relating to waste generated during closure, since closure pursuant to Part 61 is not within the scope of the AIF license application.

The Agency Review Guidance was derived from NUREG-1200, which was edited to eliminate references to waste generated during closure and information redundant with NUREG-1199. Additional overall guidance on safety assessment objectives and approaches which is relevant to Sections 6.1 through 6.6 of this guidance document is set forth in NUREG-1200, Standard Review Plan 6.1 entitled "Release of Radioactivity - Introduction." This guidance should be consulted because it generally discusses the development of scenarios for potential releases of radioactivity and describes an overall approach for the assessment of potential doses through analysis of various transport pathways. NRC SRP 6.1 is only relevant to an AIF to the extent that it discusses assessment of doses during the "operational" period for the facility. Discussion of doses during the other four phases of disposal facility operation (closure, observation and surveillance, active institutional control, and passive institutional control) are outside the scope of the AIF license application.

6.2 COVER SYSTEM INFILTRATION

Application Contents

This topic deals with the matter of water infiltrating through the engineered cover system (not into the concrete isolation vaults, which will be prevented). It applies, primarily, to the evaluation of earthen covers, over the concrete vault roof, where utilized to protect against freeze-thaw cycles. The applicant should provide hydrologic infiltration values for input into the description of how site covers will be designed to limit water infiltration and to direct percolating or surface water away from the assured isolation units. All data used to generate infiltration estimates should also be included.

The basis for the projected infiltration values should be described. For example, if no analysis was performed, and a value was simply chosen (for instance, a percentage of total rainfall), the applicant should defend the decision. If analyses were performed, the applicant should present a description of the conceptual model and the analytical or numerical methods used, including a discussion of the assumptions, boundary condition, governing equations, documentation, verification, calibration, and justification that the analysis is adequately conservative or realistic. If a numerical code was chosen, but is described elsewhere in the application, it should be referenced. Results from the analyses should be in a format of volume of flux entering the system per annum, length of time between deep percolation events, and zones of potentially high percolation.

Agency Review Guidance

To adequately evaluate the information on determination of flux through the engineered cover system and the results of any calculations or analyses, the staff will need information pertaining to:

1. The justification, documentation, verification, and calibration of any equations or program codes used in the analysis;

2. The description of data and justification for the manipulation of any data used in the analyses.

Moreover, the staff may require information reviewed in other relevant sections of the application.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for the application contents for Section 6.2 "Infiltration." Section 6.1.2 of NUREG-1199 was adopted with minor edits to remove references to "disposal" facilities and "closure" periods. The Agency Review Guidance is taken directly from the regulatory evaluation criteria of NUREG-1200, section 6.1.2. In this regard, it is important to recognize that "infiltration," as discussed in this section, refers to engineered cover system infiltration. It does not refer to infiltration into the AIF concrete isolation vaults, which will be prevented.

6.3 RADIOLOGICAL RELEASE – NORMAL CONDITIONS

Application Contents

The applicant should provide a reasonable, yet conservative, assessment of radioactivity release into each of the most significant radioactivity transport mechanisms during the life of the facility. For an AIF the most significant radioactivity mechanisms include direct radiation and air pathways. The information must be sufficient to enable an independent evaluation of the releases anticipated from the facility. The information provided herein provides a source term for calculations of impacts (1) on offsite individuals based on normal facility conditions, and (2) on onsite individuals conducting normal activities.

Typical scenarios by which radioactivity may be released are listed in NUREG-1199, Tables 6.1 and 6.2, although some of these are not applicable to an AIF. These scenarios are only for illustration, and the applicant should provide an analysis that identifies and quantifies the most significant scenarios based on the specific details of the site environment, the facility waste acceptance criteria, and the facility design and operating practices. Significant scenarios should include those that contribute at least 5 percent calculated impacts to an individual at the critical receptor point.

To the extent that calculations of radioactivity release are based on waste stream specific models, the applicant's assumptions and analyses for each individual waste stream should be defensible. Should the applicant propose to assume similar release models or parameter values for groups of waste streams, then an acceptable approach would be to assume the most conservative radioactivity release model or parameter values for all waste streams in the group. Use of other than the most conservative release model or parameter values should be justified by the expected distribution of the characteristics of individual waste streams forming the group.

In addition, if credit is taken for inhibition of radioactivity release due to special waste form, waste packaging (e.g., isolation within high-integrity containers), or isolation techniques, those waste streams that will be isolated pursuant to these techniques should be identified. The influence of these special waste form, waste packaging, or isolation techniques should be quantified.

Relevant data for this section may be referenced in other sections of the application.

Agency Review Guidance

Direct Gamma Radiation

In its review, the staff will confirm that the applicant has identified and quantified the most significant scenarios for impacts on individuals caused by exposure to direct radiation. These scenarios may vary widely depending on the facility design and operation, the waste acceptance criteria, and site environmental conditions. Examples of scenarios include:

- Gamma radiation emitted by a group of waste delivery vehicles waiting to enter the facility area;

- Gamma radiation emitted as a part of facility operations.

The information provided, and the applicant's methods for determining exposure via direct gamma radiation, should enable the staff to, at a minimum, confirm that (1) an assessment of radiation levels and times for gamma radiation has been performed, and (2) an analytical approach for groups of waste delivery vehicles has been adopted. An acceptable approach would be to assume a typical grouping of vehicles emitting radiation corresponding to maximum levels allowable pursuant to DOT regulations.

Release Through Air Pathways

In its review, the staff will confirm that the applicant has identified and quantified the most significant scenarios for radioactivity release through air pathways. These scenarios may vary widely depending on the site design and operation, the waste acceptance criteria, and site environmental conditions. However, a sample list of potential release scenarios include the following:

- Decomposition of waste resulting in emanation of decomposition gases such as methane, C02, or H2;

- Evaporation of water collecting in isolation units or sumps, or otherwise having the potential for contacting isolated waste;

- Airborne release of removable contamination from waste containers;

- Release of gaseous radioactive waste;

- Release of gasses, such as radon, formed by radioactive decay.

The release scenarios will be used as source terms for estimating the impacts on offsite individuals associated with normal facility conditions, as well as source terms for estimating impacts on onsite individuals. Otherwise, the information provided, and the applicant's methods for determining radioactivity release through air pathways, should enable the staff in its review, at a minimum, to confirm the provision of the following information and the adoption of the following analytical approach:

1. All significant points and area discharge points are identified and quantified.

2. An assessment has been provided of any change in radioactivity release during the facility's lifetime.

3. To the extent that airborne releases are controlled through action levels proposed as part of a site survey or environmental program, the action levels may be used as a basis for release calculations. This might be the case for the above release mechanisms associated with evaporation of onsite water or airborne release of removable contamination from facility grounds, surfaces, or buildings. This approach is acceptable if sufficient information is provided to confirm that the proposed environmental monitoring and survey program will detect the presence and/or movement of radioactivity from the locations of concern, and if the action levels are established sufficiently low so that radioactivity movement is detected before regulatory criteria are exceeded.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 6.3 "Radiological Release - Normal Conditions." It has been modified to remove references to radionuclide release assessments for "each of the five periods of concern in the life of a disposal facility," in order to focus on the assessments needed to support AIF operations.

Estimating the consequences of releases to the groundwater, surface water, or the biotic pathway is not necessary. The facility is designed to preclude releases from the isolation units and instead, to identify and intercept any such potential releases. Thus, efforts to estimate the vanishing small probabilities and consequences of potential releases from the isolation unit

would provide only a very small incremental assurance that releases from an AIF would not have unacceptable consequences.

The intended monitoring systems will verify that no radioactive releases occur from the waste canisters, vaults, or the leachate collection and leakage detection system, or will identify such releases soon after they begin. In so doing, they will verify that no releases are occurring from the isolation units, themselves, and that none are occurring beyond AIF the site boundaries.

The Agency Review Guidance was derived from NUREG-1200 which has been edited to remove references to release scenarios and assessments related to disposal facility post-operational periods of concern, which are outside the scope of the AIF license application.

6.4 RADIONUCLIDE RELEASE – ACCIDENTS OR UNUSUAL OPERATIONAL CONDITIONS

Application Contents

The applicant should provide information regarding the types, significance, and magnitudes of radioactivity release associated with accidents or unusual operational conditions. The information should be sufficient to enable an independent staff analysis of projected radiological impacts.

Identification of Accidents or Abnormal Operating Conditions

At a minimum, the applicant should provide the following information:

1. The applicant should identify and discuss the principal accidental or unusual operational scenarios by which radioactivity may be released and result in impacts on offsite individuals. This discussion should first identify a complete spectrum of possible release scenarios, and then eliminate those that are bounded by other scenarios. This discussion should include justification as to the choice and ranking of possible scenarios. The intent is to go from a complete list of scenarios to those that are representative and bounding.

2. In the above discussion, the applicant may reference (a) generic information and analyses, (b) regulatory requirements that preclude certain scenarios from occurring or otherwise limit the release of radioactivity (e.g., in terms of the rate at which radioactivity is released or the period of time that the release rate occurs), and (c) proposed conditions of waste acceptance or facility design and operation that preclude certain scenarios from occurring or otherwise limit the release of activity.

Evaluation of Release

At a minimum, the applicant should provide the following information:

1. For each of the principal scenarios identified above, the applicant should provide an estimate of radioactivity release and event frequency that are reasonable, yet conservative. In so doing, the applicant may reference (a) generic information and analyses, (b) regulatory requirements that limit or bound the possible event frequency or magnitude of release, and (c) proposed conditions of waste acceptance or facility

design and operation that limit or bound the possible event frequency or magnitude of release.

Experience at other licensed facilities may also be referenced provided the relationship between that experience and proposed AIF operations is clear.

2. The applicant should provide information that enables quantification of the source term for the principal mechanisms by which radioactivity, once released, may be transferred from the facility. These transfer mechanisms may include air and surface water pathways.

Agency Review Guidance

The staff will review the information in the application pertaining to the applicant's assessment of the types, significance, and magnitudes of radioactivity release associated with accidents or unusual operational conditions.

The findings and conclusions of the review under this section will be principally used, in conjunction with those of the review under Section 6.1 ("Determination of Types, Kinds, and Quantities of Waste"), to analyze the applicant's projections of potential releases from the facility resulting from accidents or unusual operational conditions. The numerical estimates of radionuclide release form the source term for calculations of transfer of radioactivity to human access locations. These are expected to principally involve transport via air, but may also involve transport via surface water. Resultant radiological impacts are then determined under Section 6.6 below ("Assessment of Impacts and Regulatory Guidance").

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for Section 6.4 "Radionuclide Release - Accidents or Unusual Operational Conditions." It has been adopted with only minor edits to eliminate references to "disposal" facilities. NUREG-1200 is the primary source for the Agency Review Guidance. It has been edited to remove information redundant with NUREG-1199.

6.5 TRANSFER OF RADIOACTIVITY TO HUMAN ACCESS LOCATION

Application Contents

In these sections, the applicant should provide a reasonable, yet conservative, assessment of each of the most significant radioactivity transport mechanisms during the life of the facility. For an AIF, the most significant radioactivity transport mechanisms include direct radiation and air pathways. The information provided herein provides an analysis of the mechanisms by which releases reach human access locations, so that radiological impacts on individuals can be assessed (Section 6.6). The information must be sufficient to enable an independent evaluation of these transfer mechanisms. Offsite individuals under normal facility conditions need to be considered. Typical scenarios and their associated transfer mechanisms are listed in Tables 6.1 and 6.2 of NUREG-1199, although only the scenarios involving the direct radiation and atmospheric pathways are applicable to an AIF.

Transfer Mechanism - Direct Radiation

The applicant should fully describe the attenuation of gamma radiation through air. Specific information that should be provided for gamma attenuation includes the description and validity of the mathematical methods used to describe buildup, shielding, and absorption effects; the model used to calculate external exposure to electrons; and the analytical methods used to simulate various source geometries (points, planar, volume).

Transfer Mechanism - Air

The applicant should describe the models, computer codes, and computational methods used to estimate the downwind atmospheric and surface concentrations of gaseous and particulate contaminants released from the site for both routine and accident conditions. These methods should be capable of calculations for commonly used waste geometries (point, area, and volume sources, etc.). The applicant should clearly identify the computational methods used to quantify removal mechanisms and the wet/dry deposition rates used in the calculation of the surface area concentrations. Demographic information should be included to enable the staff to calculate values of the concentrations used in the estimation of population doses in the Environmental Report.

Airborne and surface concentrations should be reported (in graphical or tabular form) as normalized, time-integrated, annual-average concentrations for both radiological and

nonradiological contaminants. For accident conditions, the models and assumptions used to estimate downwind concentrations that result from a puff release (such as during a fire) should be explicitly identified.

The meteorological parameters used in the models should be based on site-specific data collected from at least 1 year of air-quality monitoring. A discussion of the limitations and accuracy of these parameters for these calculations should be included. The kinds of meteorological data to be used for these calculations are given in Draft Reg. Guide Task ES 401-4, "Onsite Meteorological Measurement Program for Uranium Recovery Facilities - Data Acquisition and Reporting," September 1985.

The projected concentrations for airborne pollutants and the surface depositions should be calculated:

1. At the site boundary points for each of the 22.5° radial sectors centered on the 16 cardinal compass directions;

2. At the location of the maximally exposed individual (offsite);

3. At the nearest present and known future offsite receptors (i.e., residence, milk cow, milk goat, meat animal, and farm or vegetable garden larger than 50 km^2) for each of the 22.5° radial sectors; and

4. For offsite individuals.

Agency Review Guidance

Transfer Mechanism - Direct Radiation

The information in the application should be sufficient to ensure a reasonable, yet conservative assessment of gamma attenuation during the life of the AIF. For gamma attenuation, exposures to onsite personnel are of most concern. The information should be sufficient to enable the staff to perform an independent, confirming analysis.

Transfer Mechanism - Air

Atmospheric Transport and Diffusion Model

The staff will determine the acceptability of the atmospheric transport and diffusion model based in part on (1) the representativeness of the site-specific input data used for the model, (2) the capability of the model to account for the physical characteristics of the site (such as structures, irregular terrain, and wet and dry deposition), and (3) the capability of the model to account for the physical and chemical characteristics of releases from the site (such as particle size and transformations during transport).

Meteorological Data for the Model

Meteorological data to represent conditions at the AIF site should be collected in support of the license application. Acceptable sources include nearby meteorological monitoring and recording facilities. The applicant should have provided locations, downwind distances, and elevations for each receptor point (preferably on a topographic map) in order to enable the staff to verify the applicant's calculations.

Airborne Concentrations (Applicant-Calculated)

The applicant should calculate airborne concentrations and the concentrations of contaminants deposited on terrestrial surfaces for all locations of the receptors. Airborne concentrations should have been presented for both routine and accident conditions. These concentrations should have been reported as annual average values for comparison to the limits specified in the third Performance Objective, to the extent applicable as discussed in Volume 1. However, for those concentrations calculated for intermittent or infrequent releases resulting from accident conditions, consideration should also have been given to the frequency and duration of the release. The applicant's information should be complete and consistent with meteorological, demographic, and transfer factor data provided in the related sections of the application and the applicant's results should compare favorably with estimates of concentrations determined independently by the staff.

Bases for Selection of Application Contents and Agency Review Guidance

The primary source for the Application Contents of Section 6.5, "Radionuclide Transfer to Human Access Location," is NUREG-1199. The direct radiation (gamma attenuation) and air pathways are considered to be the most significant transfer mechanisms during the life of the AIF. Therefore, references to the assessment of groundwater and surface water pathways have

been removed from this section based on the anticipated design and operational characteristics of an AIF. In addition, any references to "the five periods of concern in the life of the disposal facility" have been eliminated since active monitoring and surveillance will be ongoing throughout the life of the AIF. Other minor edits include changing references from "disposal" to "assured isolation."

NUREG-1200 is the primary source for the Agency Review Guidance. It has been adopted into this section with modifications similar to those described above.

6.6 ASSESSMENT OF IMPACTS AND REGULATORY COMPLIANCE

Application Contents

This section provides a culmination of the analyses and information presented in Sections 6.1 through 6.5. In this section, the applicant should provide information that demonstrates compliance with regulatory limits for potential radiological impacts associated with the facility. Specific impacts to be determined include those associated with (1) releases under normal conditions and (2) releases due to accidents or unusual operational conditions.

An acceptable way to organize the information in this section is to first address calculations of radiological impacts on individuals and then address compliance with regulatory criteria.

Calculation of Radiological Impacts on Individuals

Calculations of radiological impacts on individuals have the potential for considerable complexity. Given this fact, it is recommended that the applicant organize the information presented herein so that it first addresses the overall scope of the analyses and then addresses the specific details of the analyses.

Analyses Scope

An acceptable way to organize the required information is to first identify the principal receptor points of concern (i.e., the principal human access locations), then identify the particular exposure media in which radioactivity is projected to be present, and finally to identify and confirm the principal uptake pathways. Rationale and discussion should be provided for assumed changes in receptor points, exposure media, and uptake pathways as a function of time.

The above three-stage hierarchy is illustrated in Tables 6.3 through 6.5 of NUREG-1199 for releases resulting from normal operations. It should be noted, however, that the particular receptor points, exposure media, and uptake pathways that would be considered for a particular facility would be entirely dependent on the proposed design and operation of the facility, as well as onsite environmental conditions. The examples illustrated in Tables 6.3 through 6.5 of NUREG-1199 may therefore be incomplete or inapplicable.

The site boundary should be considered as a receptor point for abnormal or unusual operational releases. The exposure media of concern would at a minimum include air for this first receptor

point. Exposure media of concern would at a minimum include contaminated onsite air and direct radiation.

Details of Analyses

Information addressed herein should at a minimum include the following:

1. Computational models and analytical methods for transfer of radioactivity through uptake pathways; (Transfer models generally based on the methodology in NRC Regulatory Guide 1.109 are acceptable, although specific parameters for inclusion in the model should be reviewed and replaced with updated or site-specific parameters as appropriate.)

2. Assumptions for occupancy times, exposure periods, growing season, usage parameters, and physiological and metabolic parameters; (In this regard, Regulatory Guide 1.109 may be used as a general reference. Updated or site-specific information should be used as appropriate.)

3. Dose conversion factors for direct exposures to beta and gamma radiation, as well as acceptable dose conversion factors for exposure to internal organs due to inhalation pathways; (External beta/gamma exposures due to proximity to uniformly contaminated surfaces may be based on the methodology presented in NUREG/CR-1918, or methodology of equivalent sophistication, as may external beta/gamma exposures due to immersion in contaminated air. Exposures to internal organs due to inhalation pathways should be based on the methodology in International Commission on Radiological Protection, Publication 30, or its equivalent.)

4. Conceptual models and exposure scenarios;

5. A comparison of the compilation of site-specific data pertinent to pathways analyses with data obtained during the site characterization program;

6. Details of computer codes to determine impacts; (Such codes may be referenced.)

7. Information sufficient to ensure that the analysis includes all pathways of interest, that is, pathways that contribute at least 5% of the total potential dose rate at each receptor point of interest.

Compliance With Regulatory Criteria

The information presented herein should provide a comparison of the potential radiological impacts determined above with applicable regulatory criteria. At a minimum, reasonable assurance should be provided regarding the following:

1. Potential normal offsite releases will be controlled so that impacts on individuals through the particular combination of pathways inherent at the access location of concern are within the limits specified in 10 CFR § 20.1301 and are furthermore reduced to levels as low as reasonably achievable.

2. Potential impacts on offsite individuals as a result of operational accidents and abnormal occurrences will be controlled to levels as low as reasonably achievable, where the term "as low as is reasonably achievable" is defined in 10 CFR Part 20.

The applicant's assessments of compliance with the above criteria are not limited to numerical assessments of potential dose rates but may also include the applicant's commitments and proposed limiting conditions of operations, the applicant's proposed environmental monitoring and survey program, the ease in which operations can be adjusted to eliminate or mitigate potential releases of radioactivity, past environmental monitoring and waste handling history at other licensed facilities, and the applicant's training and experience.

Agency Review Guidance

The staff will review the following areas of the application with respect to (1) calculations of radiological impacts on individuals, and (2) compliance with regulatory criteria.

Calculation of Radiological Impacts on Individuals

Specific impacts to be calculated include those associated with (1) releases resulting from normal conditions, and (2) releases resulting from accidents or unusual operational conditions.

Compliance with Regulatory Criteria

The staff will review the applicant's assessment of compliance. This review should be documented and cover at least the following areas:

1. Normal impacts on offsite individuals during facility operations;

2. Impacts on offsite individuals resulting from operational accidents or unusual conditions.

Bases for Selection of Application Contents and Agency Review Guidance

NUREG-1199 is the primary source for section 6.5 "Assessment of Impacts and Regulatory Compliance". It has been modified to eliminate references to impacts during the "active institutional control period" for a disposal facility and to the other post-operational periods of concern for a disposal facility. These are outside the scope of an AIF license application. NUREG-1200 is the primary source for the Agency Review Guidance. It has been edited to remove information redundant with, and references comparable to those deleted from, NUREG-1199.

7.0 RADIATION SAFETY

Application Contents

Information should be provided, as indicated, in the areas specified below.

7.1 As Low As Is Reasonably Achievable (ALARA) Policy

The application should include a policy for keeping exposures to personnel and the general public ALARA. The ALARA program should present procedures and methods of operations utilized to implement the ALARA policy. In addition, an ALARA committee should be established composed of management individuals from radiation protection, environmental, safety, and operations. The committee membership should be committed to review the radiation safety program at least annually. The organization structure of the Radiation Safety Organization and how it interacts to maintain ALARA should be included in the application. Reg. Guide 8.10, Revision 1-R, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Is Reasonably Achievable," should be used in the development of the ALARA program.

7.2 Organizational Relationships and Personnel Qualifications

The application should include a detailed organizational chart showing the Radiation Safety organization and its relationship to senior facility personnel and other line managers, as well as job descriptions, authorities, and responsibilities of Radiation Safety personnel. The education and work experience that is required for the various Radiation Safety positions should be stated in the radiation protection program.

7.3 Radiation Safety Procedures and Radiological Work Permits (RWPs)

The application should include a policy that commits the applicant to use written, approved radiation safety procedures and RWPs to carry out activities related to the radiation safety program. The application should also include a policy that details the review and revision cycle for the procedures and RWPs, as well as state which Radiation Safety staff positions are required to review, revise, and update the procedures. A policy detailing when an RWP is required, the staff positions that may approve RWPs, the information to be included on RWPs, the provisions for updating and terminating RWPs, and the records to be kept concerning RWPs, should also be included with the application. The application should also include a policy that states that other organizations will approve RWPs if non-radiological hazards are also involved.

7.4 Training

The application should include a training policy that all personnel and visitors entering restricted areas shall receive appropriate radiation protection training or be escorted by appropriately trained personnel. The application should also include the training curriculum (e.g., a list of classes and class outlines) and the instructors' qualifications. The technical content of the training should be commensurate with the potential radiological hazards and shall meet the requirements of 10 CFR Parts 19 and 20. The policy for retraining should require refresher training every 2 years following the initial training; this training should include a condensed version of the original training and any changes made since the initial training.

7.5 Ventilation Systems

The application should include a basis for designing and operating any applicable ventilation systems in a manner that protects personnel and the public from airborne radioactive material. The application should document that the ventilation system will ensure that the limits of 10 CFR Part 20 are not exceeded during normal operations. The criteria for the ventilation system(s) should be included in the application and should consist of: minimum flow velocity at the hood openings, the types of filters and the maximum differential pressure across filters, and the frequency and types of tests required to measure ventilation system performance. A policy should be included that requires the use of engineered controls to limit the intake of radioactive materials, including airflow from areas of lower contamination to areas of higher contamination.

7.6 Air Sampling

The application should address representative air sampling in those areas where air sampling is required. The following should also be included in the application:

1. A determination that the air sampling parameters in each area are adequate in accordance with NUREG-1400, "Air Sampling in the Workplace..";

2. The methods used for calibrating the air sampling and counting equipment;

3. A description of action levels and alarm set points;

4. The basis used to determine the action levels, investigation levels, and Derived Air Concentrations (DACs) and the minimum detectable activity (MDA) for the radionuclides used;

5. The frequency and methods of analysis of airborne concentrations and the total radioactivity levels for each area;

6. The radiation counting techniques;

7. The specific calculations and levels;

8. The action levels and investigation levels;

9. The location of continuous air monitors (CAMs), if used, and annunciators and alarms associated with CAMs.

7.7 Contamination Control

The application should include a description of a contamination survey program. The description should include the types and frequencies of surveys, limits for removable and fixed contamination levels, the methods and instruments used in the surveys, and the action levels and actions to be taken when the levels are exceeded. The design features of the facility that help control contamination and access, including step-off-pads and personnel monitoring equipment at exits, should be included in the application.

The application should also include the following particulars with respect to contamination control: (1) a description of the types and quantities of contamination monitoring equipment; (2) a description of personnel (skin and clothing) contamination limits, provisions for personnel decontamination, protective clothing necessary to enter restricted areas, allowable limits (fixed and removable), and action levels for immediate clean-up or delayed clean-up for clean areas, intermediate areas and contaminated areas; (3) the technical criteria and levels for defining contamination areas; (4) criteria for the unrestricted radiological contamination release of personnel, tools, equipment, material, premises, or scrap; (5) the requirements for investigating personnel skin or clothing contamination, as well as tracking and trending of this data; (6) the requirements for frisking each time personnel exit at a posted contaminated area; and (7) the criteria for leak checking sealed sources.

7.8 External Exposure

The application should include a policy to measure, assess, and record personnel external radiation exposure. The application should include a description of the types of monitoring equipment used and the types of radiation measured. The description should include the type, range, sensitivity, accuracy, and frequency for reading personnel dosimeters and recording the radiation dose. The application should include evidence of participating in, or plans to participate in, the National Voluntary Laboratory Accreditation Program to test dosimeters.

7.9 Internal Exposure

The application should include a description of the internal exposure program that complies with the requirements of 10 CFR §§ 20.1201, 1204, and 1502(b). The description of the internal exposure program should include the methods to be used, the frequency of analysis, the sensitivity and minimum detection levels, the frequency of measurements, the criteria for participation, and the action levels and actions to be taken based on results. The application should also include a description that details the methods to determine if internal exposure monitoring is required and the methods for determining the worker intake from: airborne radioactivity measurements, in vivo bioassay, in vitro bioassay, or a combination of these methods.

7.10 Summing Internal and External Exposure

The application should include a policy for summing internal and external exposures in order to demonstrate compliance with dose limits and that is consistent with the following Reg. Guides: 8.7, Rev. 1 *Instructions for Recording and Reporting Occupational Radiation Exposure Data*; 8.34 *Monitoring Criteria and Methods to Calculate Occupational Radiation Doses*; and 8.36, *Radiation Dose to the Embryo/Fetus*.

7.11 Respiratory Protection

The application should include a respiratory protection program description that complies with the requirements of 10 CFR Part 20. The application should include a description of the equipment to be used, the conditions under which respiratory protection would be required for routine and non-routine operations, the assigned protection factors to be applied to each type of respirator, and locations of respiratory equipment within the plant. The Respiratory Protection Program description should also comply with ANSI Z88.2, as appropriate, in the following areas: training, control and use of respiratory equipment, mask fit testing, and breathing air purity. The application should also describe the types of engineering and administrative controls that have been implemented to reduce the risk of internal exposure without the need for

respiratory protection, and the methods for determining exposure while an individual is using respiratory protection.

7.12 Instrumentation

The application should include an instrumentation program description that lists the types and quantities of instruments that are available, including ranges, counting mode, sensitivity, alarm set points, planned use and frequency of calibration. The description should include the commitment to calibrate instruments at least annually, preferably semi-annually, and recalibrate instruments after adjustments or repairs. The description should also document the criteria for selecting radiation measurement instruments for: performing radiation and contamination surveys, sampling airborne radioactivity, monitoring area radiation, monitoring personnel, and performing radioactive analyses. The description should also list the instrument storage, calibration, and maintenance facilities, the health physics (radiation safety) facilities, and the laboratory facilities used for radiological analyses. The instrument calibrations should be traceable to the National Institute of Standards and Technology (NIST).

Agency Review Guidance

The purpose of this review is to determine that the applicant commits to implementing a radiation protection program that is adequate to protect the radiological health and safety of the occupational workers and to comply with the regulatory requirements imposed by the Commission in 10 CFR Parts 19, 20, 30, 40, and 70.

1. ALARA (As Low As Is Reasonably Achievable) Policy

   The reviewer should determine that the applicant commits to an ALARA program. The ALARA program should be evidenced and documented by an organizational structure in which radiation protection personnel interact, in a timely manner, with operational personnel to ensure that methods and techniques for reducing occupational radiation exposure are incorporated in facility operation.

   An ALARA committee, or other similar safety committee, should be composed of managers from radiation protection, environmental, safety, and production. The committee's membership should be documented and its scope should be to review the radiation safety program at least annually. The review should include the results of audits and self-assessments made by the radiation protection organization and reports of radiation levels, contamination levels, employee exposures, waste management, and effluent releases. The review should determine:

a. If there are any upward trends toward increased personnel exposure developing in identified categories of workers, types of operations, or effluent releases;

b. If exposures and releases are being lowered or maintained in accordance with the ALARA concept;

c. If equipment for effluent and exposure controls is being properly used, maintained, and inspected.

Trend analysis should be performed in such areas as the following:

- Radiation exposures of plant workers and members of the public;
- Concentrations of airborne radioactivity in facility areas and effluents;
- Radioactive contamination in facility areas and on equipment;
- Operation of radiation measurement instrumentation;
- Operation of respiratory protection equipment;
- Operation of effluent filtration systems.

2. Organizational Relationships and Personnel Qualifications

The reviewer should determine that the applicant commits to an organization in which the administrative organization of the radiation safety program is identified and includes the authority and responsibility of each position identified. In addition, the applicant should describe the organizational relationships that are to exist between the individual positions responsible for the radiation safety program and other line managers. The Facility Manager, or equivalent, should have overall responsibility and authority for safety. The Radiation Safety Manager, or equivalent, may be delegated direct responsibility for establishing and implementing the radiation protection program and shall have direct access to the Facility Manager. Certain radiation safety technical support and/or audit activities may be supplied by qualified offsite corporate or consultant organizations.

3. Radiation Safety Procedures and Radiation Work Permits (RWPs)

The reviewer should determine that the applicant commits to using written, approved radiation safety procedures and RWPs to carry out activities related to the radiation safety program, and that the procedures and RWPs are reviewed, and updated periodically. A mechanism for providing a current copy of the procedures to personnel should be established. Procedures should be reviewed and approved by the Radiation Safety Manager, and no longer than every 2 years the Radiation Safety Manager, or an individual who has the qualifications of the Radiation Safety Manager, should revise and update the procedures as necessary.

The applicant should make a commitment to use special reviews and approvals before conducting an activity involving licensed materials that is not covered by a written radiation safety procedure. The applicant should specify how the determination is made to use an RWP, the positions within the organization authorized to approve and issue an RWP, the types of information that should be included in an RWP, the provisions for updating and terminating an RWP, and the records to be kept for the RWPs. The application should specify the levels of approval necessary for an RWP before it can become effective and that the RWP should be approved and signed by a designated supervisor or specialist in radiation protection. Approvals should also be required from other involved groups to ensure that the provisions of the RWP cover all potential hazards and that the operations will be conducted according to proper standards.

The applicant should commit to using RWPs for specific purposes only. RWPs will be reissued when significant changes in the task or changes that affect the safety of the worker are made. The applicant should state that the RWP will include a list of the safety requirements for work conducted under the authorization and will include the following, as applicable: (1) the type and frequency of monitoring to be conducted; (2) the total time allotted for the authorization; (3) special shielding or ventilation to be used; (4) personal protective equipment; (5) work limitations; (6) radiological conditions; and (7) special instructions.

The applicant should commit to a system that ensures that RWPs are not used past their termination dates. The system should include what types of records are to be kept, the retention times for these records, and the final disposition of the RWP. The record system should be sufficient to allow independent auditors to reconstruct the circumstances necessitating the RWP.

4. Training

The reviewer should determine that the applicant commits to a training program such that all personnel and visitors entering restricted areas should either receive training in radiation protection or will be escorted by an individual who has received such training. The technical content of the training program should be commensurate with the potential radiological health protection problems in the restricted area and should meet the requirements of 10 CFR Parts 19 and 20. The training should cover the following areas, as appropriate, in sufficient depth for the specific types of functions: (1) access and egress controls and escort procedures; (2) radiation safety principles, policies, and procedures; (3) internal and external exposures; (4) personnel dosimeters; (5) monitoring instruments and protective devices; (6) contamination control, including protective clothing and equipment; (7) radiation area and airborne radioactive area; (8) use, storage, and transfer of radioactive materials; (9) posting and labeling requirements; (10) ALARA

and exposure limits; (11) radiation hazards and health risks; and (12) emergency response requirements for individuals.

Refresher training should be completed not later than 2 years following the most recent training and should consist of a condensed version of the initial training, with emphasis on changes in policies, procedures, requirements, and facilities. The effectiveness of the training program should be evaluated by written tests and other methods, and should include evaluation of the curriculum and the instructor's qualifications.

5. Ventilation Systems

The reviewer should determine that the applicant commits to a policy for designing and operating appropriate ventilation systems in the facility in a manner that protects operating personnel and the public from airborne radioactive material and assures that the limits of 10 CFR Part 20 are not exceeded during normal operations. The applicant should specify criteria for the ventilation systems, including minimum flow velocity at openings of hoods, maximum differential pressure across filters, and types of filters to be used, where applicable. In addition, the applicant should specify the frequency and types of tests required to measure ventilation system performance, the acceptance criteria, and the actions to be taken when the acceptance criteria are not satisfied.

Airflow patterns should be from areas of lesser contamination potential to areas of greater contamination potential. Engineering controls should be used to limit the intake of radioactive material.

6. Air Sampling

The reviewer should determine that the applicant commits to providing representative air sampling for areas in which a potential exists for airborne radioactive materials. Air sampling data should be provided that demonstrates that exposures do not exceed established limits and that exposures are maintained ALARA.

The applicant should provide for each work area a determination that the frequency for analyzing the airborne level of radioactivity, the counting techniques, and the method for determining the airborne concentration are adequate. The calibration methods and frequencies that ensure proper operation of the instrumentation and the calculations of airborne concentrations, in various areas, to obtain the airborne levels, should also be described. The application should contain a description of action levels, alarm set points, frequency of measurements, and action to be taken when airborne levels are exceeded. In those facilities where CAMs are used, the location of the CAMs and the readouts, annunciators, and alarms should be described.

The applicant should demonstrate that the action levels, investigation levels, and derived air concentrations (DACs) used are based on appropriate technical criteria to evaluate air sampling and monitoring results and determine necessary control procedures. The minimum detectable activities (MDAs) for the specific radionuclides of interest should be provided.

7. Contamination Control

The review should determine that the applicant commits to establishing a contamination survey program, based on Reg. Guide 8.24, that includes the types and frequencies of surveys, limits for contamination levels, and methods and instruments used in the surveys. Information should be stated about survey frequency for each area, the types of radiation, the criteria for contamination levels for both removable and fixed contamination and the action levels and actions (including the time frame for action initiation and completion) to be taken when the levels are exceeded.

The applicant should describe the features of the facility that help control contamination including step-off pads, personal monitoring equipment at exits, and change rooms. The applicant should specify: (1) the types and availability of contamination monitoring equipment, (2) the specific limits established for personnel contamination, (3) the minimum provisions for personnel decontamination, (4) the minimum types of protective clothing necessary for individuals to enter restricted areas, and (5) the technical criteria and levels for defining contamination areas. Sealed sources should be leak-tested on a regular basis.

The applicant should commit to a periodic review of all aspects of access control to determine that: (1) signs, labels, and other access controls are properly posted and operative; (2) restricted areas established to prevent the spread of contamination are identified with appropriate signs; and (3) step-off pads, change facilities, protective clothing facilities, and personnel monitoring instruments are adequate. The reviews should be documented, along with any deficiencies and the corrective actions taken.

Allowable limits (fixed and removable) and action levels for immediate cleanup or delayed cleanup should be specified for clean areas, intermediate areas (change rooms), and contaminated areas.

The radiological contamination levels of items (e.g., tools, equipment, material, premises, or scrap) given clearance for release for unrestricted use should be in accordance with NRC's Branch Technical Position, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated April 1993.

A system should be established to ensure that equipment and materials removed from contaminated areas are not contaminated above specified release levels. Maximum permissible personnel contamination levels (skin and clothing) should be established. Detected contamination in excess of these levels should be investigated and documented as to source, probable cause, and other pertinent information. Records of these investigations should be maintained and reviewed by radiation protection management for trends and corrective action taken, as necessary.

The policy on the use of personnel monitoring equipment should be stated. Personnel should perform a whole body survey each time they leave known contaminated areas, or a minimum of a hand and shoe survey each time they leave restricted areas that are potentially contaminated.

8. External Exposure

The reviewer should determine that the applicant commits to a personnel monitoring program for external radiation that provides a means to measure, assess, and record personnel exposure to radiation and commits to an ALARA philosophy. The types of monitoring equipment that will be used and the types of radiation that will be measured should be described. Reg. Guide 8.34, *"Monitoring Criteria and Methods to Calculate Occupational Radiation Doses"*, provides guidance for determining who is required to wear personnel monitoring dosimeters. The type, range, sensitivity, accuracy, and frequency for reading personnel dosimeters and recording the radiation dose of the dosimeter reading should be stated. In addition, the use of dosimetry results as a guide to operational planning and the specific exposure levels below the regulatory requirements at which action will be taken to reduce exposures should be specified. The applicant should participate in or have plans to participate in the National Voluntary Laboratory Accreditation Program (NAVLAP) to test its dosimeters.

9. Internal Exposure

The applicant's program for internal exposure must meet the requirements of 10 CFR §§ 20.1201, 20.1204, and 20.1502(b). Reg. Guides 8.25, "*Air Sampling in the Workplace*"; 8.34, "*Monitoring Criteria and Methods to Calculate Occupational Radiation Doses*"; and 8.9. Rev. 1, "*Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program*" provide information, recommendations, and guidance and a basis acceptable to the staff for implementing the internal exposure program.

The reviewer should determine that the applicant has established a program for monitoring worker internal exposures. The program should specify the methods to be used, the frequency of analysis, the sensitivity and minimum detection levels, the

frequency of measurements, the criteria for participation, and the action levels and actions to be taken on the results. In addition, the program should specify: (1) the methods for determining if monitoring of worker internal exposure is needed; (2) the criteria for determining when it is necessary to monitor an individual's internal exposure during work hours; and (3) the methods of determining the worker intake from (a) the concentrations of radioactive materials in the work area air, (b) the quantities of radionuclides in the body, (c) the quantities of radionuclides excreted from the body, or (d) any combination of the listed methods as may be necessary for determining the intake. The action levels for internal exposure levels should be established based on the clearance time of the radioactive material from the lung.

When air sampling measurements results are used for determining worker intake, the applicant should specify the frequency of sampling and data analysis, the minimum detection levels, and the action levels and actions to be taken on the results.

When bioassay results are used for determining worker intake, the applicant should specify the types of bioassay to be used, the frequency of data collection for each type of measurement, the minimum detection levels, and the action levels and actions to be taken on the results.

10. Summing Internal and External Exposure

The reviewer should determine that the applicant commits to a policy for combining internal and external exposures in accordance with Reg. Guides 8.7, Rev. 1, "*Instructions for Recording and Reporting Occupational Radiation Exposure Data*"; 8.34, "*Monitoring Criteria and Methods to Calculate Occupational Radiation Doses*"; and 8.36, "*Radiation Dose to the Embryo/Fetus."*

11. Respiratory Protection

The applicant's program should include the equipment to be used, the conditions under which respiratory protection will be required for routine and nonroutine operations, the protection factors that will be applied when respirators are being used, and the locations of respiratory equipment within the facility. ANSI Z88.2, which defines responsibilities and requirements in the area of (1) training, (2) control and use of respiratory equipment, (3) mask-fit testing, and (4) breathing-air purity, should be used as appropriate.

The applicant should describe: (1) the types of engineering and administrative controls that have been implemented to reduce the risk of internal exposure without the need for respiratory protection and (2) the methods for determining exposure while an individual is using respiratory protection. Factors that are critical in this calculation include the time

of exposure to airborne radioactive materials, the protection factor for the respirator, the proper fitting of the equipment before use, and the measurement of the concentrations of radioactive material during the exposure.

12. Instrumentation

The reviewer should determine that the applicant commits to a policy for the maintenance and use of operating instruments in sufficient number and types to meet the requirements specified in 10 CFR Part 20. The applicant should provide a listing of the types of instruments that are available, including ranges, counting mode, sensitivity, alarm set points, planned use, and frequency of calibration. The applicant should commit to calibrate instruments at least annually, preferably semiannually, and should recalibrate instruments if the equipment is adjusted or repaired.

The applicant should justify the criteria for selecting radiation measurement instruments for:

- Performing radiation and contamination surveys;
- Sampling airborne radioactivity;
- Monitoring area radiation;
- Monitoring personnel;
- Performing radioactive analyses.

Instruments and related equipment and the quantities of such equipment provided for facility operations should be described. Also, the (1) instrument storage, calibration, and maintenance facilities; (2) the health physics (radiation safety) facilities; and (3) the laboratory facilities for radiological analyses should be described. Instrumentation and instrumentation calibration should be consistent with ANSI N42.17A and ANSI N323, as appropriate. Instrument calibration should be traceable to a recognized standard such as the National Institute of Standards and Technology.

Bases for Selection of Application Contents and Agency Review Guidance

Chapter 7 “Radiation Safety” is drawn from draft Reg. Guide 3.52 and draft NUREG-1520, as the most current and comprehensive sources of information and guidance, post-dating those addressing Part 61. Because of the generic nature of radiation control -- and the fact that the AIF is not being licensed as a terminal low-level waste disposal facility, so post-closure radiological and monitoring are not pertinent -- the Part 70 information and guidance materials

are readily adaptable for application to an AIF. In particular, with respect to the "Application Contents" information presented above, the contents of draft Reg. Guide 3.52 were essentially incorporated in their entirety. The only significant modification was the elimination of guidance relevant to the preparation of an Integrated Safety Analysis, since such an analysis does not appear to be necessary for a facility such as an AIF.

With respect to "Agency Review Guidance," draft NUREG-1520 was modified largely to eliminate repetition and guidance relevant to an Integrated Safety Analysis. In addition, specific references were added to reflect the fact that byproduct, source, and special nuclear material will all be possessed at the AIF. Conversely, other references were deleted as either being inapplicable, or of a secondary nature (e.g., ANSI standards). In this latter regard, however, such guidance might be useful in the detailed preparation of an actual AIF license application. Accordingly, preparers of such an application should consult the SRP for additional guidance.

8.0 QUALITY ASSURANCE (QA)

Application Contents

8.1 Management Commitment for QA Program

The applicant should describe management's commitment to establish a QA program that provides reasonable assurance of quality. The QA program may be structured to apply QA measures in a graded approach.

8.2 Scope of QA Program

The applicant should define the scope of the QA program based on: (1) the purpose of the application; and (2) the special considerations established to ensure facility safety.

8.3 Organizational Responsibility

Describe the organization responsible for developing, implementing, and assessing the management controls program for ensuring safe facility operations. The description should include: (1) the organizational structure; (2) responsibilities and authorities for each position assigned a function related to QA; (3) lines of responsibility and authority; and (4) lines of communication, interrelationships, and areas of responsibility and authority for all organizations performing quality-related safety activities.

8.4 QA Program Description

The applicant should provide a complete description of the QA program. The QA program should include, to the extent appropriate, the following QA programmatic elements. The QA program description should include the details for each of the selected program elements as implemented by the applicant.

1. Organization;
2. Quality Assurance Program;
3. Design Control;
4. Procurement Document Control;
5. Instructions, Procedures, and Drawings;
6. Document Control;
7. Control of Purchased Material, Equipment, and Services;
8. Identification and Control of Material, Parts, and Components;

9. Control of Special Processes;
10. Inspection;
11. Test Control;
12. Control of Measuring and Test Equipment;
13. Handling, Storage, and Shipping;
14. Inspection, Test, and Operating Status;
15. Nonconforming Materials, Parts, or Components;
16. Corrective Action;
17. Quality Assurance Records;
18. Audits.

Elements of the QA program controls may be detailed in other sections of the application. The applicant should reference other areas that present information relevant to the QA program to show the commitment to the overall QA program.

8.5 Graded QA Approach

Describe how the QA program is structured to apply QA measures in a graded manner consistent with the importance to safety of applicable controls, systems, structures or components (SSCs).

Agency Review Guidance

The purpose of the review is to determine if the applicant's QA program is adequate to provide reasonable assurance of quality. The staff review should obtain reasonable assurance that the applicant has described in the application an adequate QA program and should also determine that the level of quality controls (e.g., graded approach) is appropriate.

The applicant's QA program should be structured to apply QA measures and controls to the site design features, SSCs, and activities, in proportion (graded approach) to the importance of the SSCs or activity to the achievement of safety.

The application should identify the activities and SSCs and related controls that are required for safety, and the degree of their importance. The most important-to-safety items should be covered by high-level QA intensity and items less significant to safety may have a lower level of QA. An application may choose to apply the highest level of QA and control to all items.

The applicant should identify and define the level of application of each of the following QA programmatic elements:

1. Organization

A description should be provided of the organizational structure, functional responsibilities, charts of the lines, interrelationships, and areas of responsibility and authority for all organizations performing quality-related safety activities. Persons or organizations responsible for ensuring that an appropriate QA program has been established and verifying that activities affecting quality have been correctly performed should have sufficient authority, access to work areas, and organizational freedom to carry out their responsibilities.

2. Program

The program should be well-documented, planned, implemented, and maintained to provide control over activities affecting quality, to the extent consistent with their importance to safety.

3. Design Control

The design should be defined, controlled, and verified.

4. Procurement Document Control

Applicable design bases and other requirements necessary to ensure adequate quality should be included or referenced in documents for procurement of items or services. To the extent necessary, suppliers should be required to have a QA program consistent with the quality level of the item to be procured.

5. Instructions, Procedures, and Drawings

Activities affecting quality should be prescribed by and performed in accordance with documented instructions, procedures, or drawings of a type appropriate for the circumstances.

6. Document Control

The preparation, issue, and change to documents that specify quality requirements or prescribe activities affecting quality should be controlled to ensure that the latest documents are in use. Document changes shall be reviewed for adequacy and approved for release by authorized personnel.

7. Control of Purchased Material, Equipment, and Services

Purchased material, equipment, and services should be controlled to ensure conformance with specified requirements.

8. Identification and Control of Material, Parts, and Components

Provisions should be made to identify and control materials, parts, and components and to ensure that incorrect or defective items are not used.

9. Control of Special Processes

Controls should be established to ensure the acceptability of special processes such as welding, heat treating, nondestructive testing, and chemical cleaning and that they are performed by qualified personnel using qualified procedures and equipment.

10. Inspection

Inspection required to verify conformance of operations affecting the quality of safety-related activities, including the items and activities to be covered, should be planned and executed.

11. Test Control

Provisions should be made for tests to verify that SSCs conform to specific requirements and will perform satisfactorily in service. Test requirements should be specified in written procedures with provisions included for documenting and evaluating test results. Personnel qualification programs should be established for test personnel.

12. Control of Measuring and Test Equipment

Provisions should be made to ensure that tools, gauges, instruments, and other measuring and testing devices are properly identified, controlled, calibrated, and adjusted at specified intervals.

13. Handling, Storage, and Shipping

Provisions should be made to control the handling, storage, shipping, cleaning, and preservation of items in accordance with work and inspection instructions to prevent damage, loss, and deterioration caused by environmental conditions such as temperature or humidity.

14. Inspection, Test, and Operating Status

Provisions should be made to control the inspection, test, and operating status of items to prevent inadvertent use or bypassing of inspections and tests.

15. Nonconforming Materials, Parts, or Components

Provisions should be made to control the use or disposition of nonconforming materials, parts, or components.

16. Corrective Action

Provisions should be made to ensure that conditions adverse to quality are promptly identified and corrected and that measures are taken to preclude repetition.

17. Records

Provisions should be made for the identification, retention, retrieval, and maintenance of records that furnish evidence of the control of quality for activities important to safety.

18. Audits

Provisions should be made for planning and scheduling audits to verify compliance with all aspects of and to determine the effectiveness of the QA program; responsibilities and procedures should be identified for auditing, documenting, and reviewing audit results and for designating management levels to review and assess audit results; and provisions should be made for incorporating the status of audit recommendations in management reports.

The staff's review should verify that sufficient information was provided in the application documentation to allow a full evaluation of the applicant's QA program and that the program provisions are adequate to ensure the quality of management control for procedures, processes, and components important to the health and safety of workers and the public and to the protection of the environment. The review should establish and document the following conclusions:

a. The applicant has established and documented a commitment for an organization responsible for developing, implementing, and assessing the management controls program for ensuring safe facility operations.

b. The applicant has established and documented a commitment for a plant safety committee, and the administrative controls for staffing, performance, assessing findings, and implementing corrective actions are in place.

c. The applicant has developed a process for preparation and control of written administrative plant procedures, including procedures for evaluating changes to procedures, equipment, tests, and processes. Process for review, approval, and documentation of procedures.

d. The applicant has established and documented a surveillance, test, and inspection program to ensure satisfactory in-service performance of items and activities affecting safety. Specified standards or criteria and testing steps should be provided.

e. Periodic independent audits are conducted to determine the effectiveness of the management controls program. Management controls should provide for documentation of audit findings and implementation of corrective actions.

f. Training programs have been established and documented to provide employees with the skills to perform their jobs safely. Management controls have been provided for evaluation of the effectiveness of training programs.

g. The organizations and persons performing QA functions have the required independence and authority to effectively carry out the QA program without undue influence from those directly responsible for process operations.

h. The QA program covers all activities, and SSCs important to safety, and controls are established to prevent hazards from becoming pathways to accidents.

Bases for Selection of Application Contents and Agency Review Guidance

The basis for the application content and review guidance presented above is draft Reg. Guide 3.52 and draft NUREG-1520. The Part 61 guidance applicable to QA programs for low-level waste disposal facilities was not utilized. Part 61 guidance prescribes a very detailed QA program reminiscent of either a nuclear power plant QA program established under 10 CFR Part 50, Appendix B or an ANSI NQA-1 style program. It does not appear that such a rigorous QA program is necessary for an AIF.

The QA guidance set forth in draft Reg. Guide 3.52 and draft NUREG-1520, on the other hand, contains the same basic 18 elements as Part 61 guidance, but is not as detailed and prescriptive. It should provide greater flexibility for an AIF license applicant to determine which QA elements should be applied and how to apply those elements to an AIF.

Some changes were made to the criteria set forth in draft Reg. Guide 2.52 and draft NUREG-1520. References to the conduct of an "ISA" (integrated safety assessment) were deleted since there is no requirement to perform an ISA for an AIF, and the text was made somewhat more general to eliminate references that are peculiar to the draft Part 70 regulations. Draft NUREG-1520 was edited to eliminate redundant references and to streamline the discuss to focus primarily on "acceptance criteria" set forth in the draft guidance document. A license applicant should evaluate further how the QA criteria should be applied and implemented in the context of an AIF license application.

9.1 DECOMMISSIONING FUNDING PLAN

Application Contents

The AIF applicant should submit a decommissioning funding plan (DFP). The contents of the DFP are specified in 10 CFR §§ 30.35(a), 40.36(d), and 70.25(e). In general, the DFP must contain the following three components:

1. A site-specific cost estimate for decommissioning;

2. A description of the method(s) of assuring funds for decommissioning, i.e., financial assurance mechanism(s);

3. A description of the methods that will be used to adjust the site-specific cost estimate and associated funding level periodically, for example, every 3 to 5 years, over the life of the facility license

Decommissioning Cost Estimate

The amount of financial assurance that the applicant should provide when submitting the DFP should equal or exceed the site-specific cost estimate. This cost estimate should be sufficient to carry out all reasonable decommissioning activities, including:

1. Characterization of the facility and site for decommissioning;

2. Decontamination and decommissioning of the facility where licensed activities were conducted;

3. Packaging, shipment, and disposal of radioactive wastes

4. A final radiation survey.

A detailed cost estimate should be presented for all activities necessary for decommissioning. The cost estimate can be based on cost estimating tables in Appendix F of NRC Regulatory Guide 3.66 or other recognized cost estimating procedures as described by the applicant. The applicant should provide a:

1. Detailed cost estimate in constant dollars;

2. Description of all assumptions made in developing the cost estimate;

3. Description of all major cost elements in the cost estimate; and

4. Identification of any site-specific costs;

Cost estimating tables that organize and provide a format for determining decommissioning cost components and activities are illustrated in Appendix A (section 11.1.4) of draft NRC Reg. Guide 3.52. These tables were modified from and are more detailed than those in Appendix F of Reg. Guide 3.66 in that they include subtasks and a method to convert to total cost using cost components other than labor and material. These tables can be easily adapted by applicants. They provide an extensive checklist of decommissioning activities that should be included in the decommissioning cost estimate. Costs that should be included in the direct estimate are:

1. Labor (facility operator and contractor);

2. Management labor;

3. Equipment and supplies;

4. Radioactive waste disposal.

Additional costs (may be estimated using cost factors) include:

- Contractor overhead, management, and profit
- Miscellaneous expenses (e.g., license fees, insurance, and taxes)
- Contingencies

Suggested cost factors are given in Appendix A of draft Reg. Guide 3.52. Contingencies have been estimated as 25 percent per use as established in NUREG/CR-0130, NUREG/CR-0672, and NUREG/CR-1266.

In order to ensure the adequacy of funds for decommissioning, cost estimates should not incorporate any salvage value that may be realized with the sale of potential assets.

Applicants who submit DFPs are required to adjust cost estimates and associated funding levels "periodically" over the life of the facility license. Factors creating the need for cost estimate adjustments include inflation, changes in facility conditions, and changes in expected decommissioning procedures. Adjustments to cost estimates should be made for inflation and site-specific factors at the time of license renewal or when the amounts or types of material at

the facility change substantially. Inflation adjustments should be made by calculating costs in current dollars. Current dollars estimates are based on prices applicable to goods and services in the year in which they are purchased. Current dollar adjustments involve updating cost estimates with current prices for goods and services.

The applicant should provide the following:

1. A statement of management's commitment (a) to update the cost estimates periodically, (for example, every 3 to 5 years) over the life of the facility license or when facility conditions change substantially and (b) to adjust the financial mechanism(s) if there is a deficit in funding to ensure that the amount in the selected mechanism(s) will be sufficient to cover the revised cost of decommissioning;

2. A description of the methods the applicant proposes to use for periodically updating the cost estimates and adjusting the financial mechanism(s) to ensure financial coverage of the additional cost.

Description of Funding Methods:

The description of the methods of assuring funds for decommissioning should include the text of the financial assurance instrument(s) that the applicant has chosen to comply with the financial assurance requirements. For additional guidance on financial assurance mechanisms, see section 9.2 below.

Adjusting Cost Estimates and Funding Levels

The applicant should describe the methods to be used to update cost estimates periodically and to revise funding levels of financial assurance mechanisms. This description should state the frequency of the cost estimate updates and the factors for change that will be addressed in preparing the update. The methods used to update the cost estimate should be described.

The applicant should also state how the revised cost estimate will be used in determining the extent to which financial assurance funding levels will be adjusted. The applicant should describe how the costs of providing additional funding, if increases are found necessary, will be covered.

Agency Review Guidance

NRC staff will review the DFP to determine whether the intent of the regulations (to ensure that the decommissioning of all licensed facilities will be accomplished in a safe and timely manner and that applicants will provide adequate funds to cover all costs associated with decommissioning) are likely to be met.

NRC staff will review the DFP to determine whether it contains the following three components:

1. A site-specific cost estimate for decommissioning;

2. A description of the method(s) of ensuring funds for decommissioning [i.e., financial assurance mechanism(s)].

3. A description of the methods that will be used to adjust the site-specific cost estimate periodically (e.g., every 3 to 5 years, over the life of the facility license)

NRC staff will review the description of the methods of ensuring funds for decommissioning to determine whether it includes the text of the financial assurance instruments(s) that an applicant has chosen to comply with the financial assurance requirements. It will also review the amount of financial assurance that the applicant has proposed in its DFP to determine whether it equals or exceeds the amount of the site-specific cost estimate. Further, the staff will evaluate the financial assurance methods required by 10 CFR Parts 30, 40 and 70, with respect to the decommissioning cost estimate and accompanying documentation submitted by the applicant to determine whether sufficient funds will be available to carry out decommissioning activities.

The NRC will review the DFP to determine whether the initial licensee has used one or more of several kinds of mechanisms to comply with the financial assurance requirements for decommissioning. The financial assurance arrangements may include the following methods:

1. Prepayment --

    a. Escrow accounts;
    b. Cash deposits, certificates of deposit, and government securities;
    c. Trust funds (including standby trusts).

2. Surety, insurance, or other guarantee method --

    a. Surety bonds;

b. Irrevocable letters or lines of credit;
c. Parent company guarantee;
d. Special government funds or accounts.

3. External sinking fund --

a. Trust;
b. Escrow account;
c. Government fund;
d. Certificates of deposit;
e. Deposit of government securities.

4. In the case of Federal, State, or local government licensees: statements of intent;

5. In the case of certain large corporate applicants: self-guarantee (see criteria in section 11.2.9, Appendix B of NUREG-1520).

Combinations of the above methods may be used, except in the case of the parent company guarantee, which cannot be combined with other financial methods.

Recommended language for the different types of financial assurance methods is provided in Reg. Guide 3.66, "*Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning under 10 CFR Parts 30, 40, 70, and 72*" (June 1990). If an applicant uses the recommended wording for a financial assurance mechanism, the only additional review necessary is to determine whether it has been appropriately executed and all the necessary items have been included in the submission.

Bases for Selecting Application Contents and Agency Review Guidance

Section 9.1 "Decommissioning Funding Plan" is drawn from draft Reg. Guide 3.52, draft NUREG-1520 and Reg. Guide 3.66 "Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72." The Part 61 funding requirements and guidelines for traditional LLW disposal facilities have not been utilized for the reasons described in Volume 1, Section IV.D of this Report.

The Application Contents guidance for the DFP is drawn primarily from draft Reg. Guide 3.52 with important departures from that document. In particular, section 11.1 of draft Reg. Guide 3.52 provides guidance for the preparation of a "Conceptual Decommissioning Plan" (CDP) as

part of an initial license application. The CDP would describe, among other things, the planned decommissioning activities, methods for protecting workers and the public during decommissioning, and the plan for coordinating a final radiation survey once decommissioning is complete.

The applicable NRC decommissioning regulations, 10 CFR §§ 30.35(e), 40.36(d), and 70.25(e) do not require the preparation of such a CDP in an application for a new license, and only require the submittal of a DFP at such time. The CDP is, in effect, a preliminary "Decommissioning Plan," specifying the manner in which decommissioning will be conducted. Licensees are not required to submit such plans until they have ceased active operations and are preparing to decontaminate and decommission their facilities. Therefore, the idea of a CDP set forth in section 11.1 of draft Reg. Guide 3.52 is not included in this guidance.

On the other hand, section 11.2 of draft Reg. Guide 3.52 provides guidance on the content of a DFP -- which is an essential part of an initial license application. This portion of the draft Reg. Guide was, therefore, utilized in preparing this guidance. Furthermore, within section 11.1 of draft Reg. Guide 3.52 relating to CDPs, there is a discussion of the preparation of detailed cost estimates for decommissioning. This discussion has been incorporated into this guidance. Some language, dealing with the provision of a "Description of Funding Methods," was taken from Reg. Guide 3.66, pages 1 through 4.

The Agency Review Guidance provided above was developed from draft NUREG-1520, section 11.2, applicable to DFPs. Information redundant with draft Reg. Guide 3.52 was deleted. As was the case with the discussion of a CDP in the Application Contents guidance above, the portions of NUREG-1520 addressing review of a CDP were largely deleted as being unnecessary and beyond applicable regulatory requirements.

9.2 FINANCIAL ASSURANCE MECHANISMS

Application Contents

The applicant should provide the text of the selected financial assurance mechanism(s).

All AIF applicants may use one or more of several kinds of mechanisms to comply with the financial assurance requirements for decommissioning. The financial arrangements specifically allowed include the following methods:

1. Prepayment -- Escrow accounts, certificates of deposit, deposit of government securities, special government funds, and trust funds (including standby trusts);

2. Surety, insurance, or other guarantee method -- Surety bonds, irrevocable letters or lines of credit, insurance, and parent company guarantee;

3. External sinking fund -- Trust, escrow account, special government fund, certificate(s) of deposit, and deposit of government securities; (A sinking fund in which deposits are made at least annually is coupled with a surety method or insurance, the value of which may decrease by the amount being accumulated in the sinking fund.)

4. Statement of intent (available only to Federal, State and local government applicants);

5. Self-guarantee, in the case of certain large corporate applicants.

Combinations of the above methods may be used, except in the case of the parent company guarantee, which cannot be combined with other financial methods.

Guidance on the information to be provided for establishing financial assurance for decommissioning and a standard format for presenting the information is given in Reg. Guide 3.66, *Standard Format and Content of Financial Assurance Mechanisms Required for Decommissioning Under 10 CFR Parts 30, 40, 70, and 72*. Recommended language and provisions for compliance for the different types of methods are given in Section 4 of Reg. Guide 3.66. Although the sample language is not required by the decommissioning regulations, except for certain provisions in the parent company guarantee, applicants will find that its use will simplify the application process and expedite NRC review. An additional sample form,

"Sample Sight Draft" (to be used if necessary to draw upon a letter of credit), is included in Appendix A (Section 11.2.5) of draft Reg. Guide 3.52.

Several exhibits and appendixes are included in Reg. Guide 3.66 to assist the applicant in complying with the financial assurance requirements associated with decommissioning. These include the following:

1. Exhibits 3-1 through 3-9 are checklists of the criteria that should be considered when submitting and reviewing the different types of financial mechanisms.

2. Appendixes A through E provide checklists of the documents that must be submitted to comply with the financial assurance requirements, depending upon the financial mechanism used. Appendix A is a master checklist to be used by all applicants. Appendixes B through E are checklists of documents to be submitted when a particular financial mechanism is used.

Criteria relating to the self-guarantee mechanism were published in the *Federal Register* [**58** (No. 248), 68726-68732, December 29, 1993; **59** (No. 8), 1618, January 12, 1994] as an appendix entitled "Appendix C to Part 30 - Criteria Relating to Use of Financial Tests and Self-Guarantees for Providing Reasonable Assurance of Funds for Decommissioning." An applicant wishing to use this mechanism should follow the criteria provided in that appendix. The appendix establishes criteria for passing the financial test for self-guarantee and establishes the terms for a self-guarantee.

Agency Review Guidance

An allowable financial mechanism should meet the following conditions:

1. The financial mechanism states whether the principal is a corporation, partnership, or individual and is in a form to allow the staff to determine whether it has been properly signed and notarized and will be effective at the proper time.

2. With regard to signatures on a financial mechanism:

   a. The mechanism is legally binding on all signatories.

   b. The applicant ensures that the parties signing the various documents are authorized to act as representatives for the firm involved in the transactions. Persons signing on behalf of the corporate principal must designate their legal

capacity and should hold the position of president or vice president of the corporation. If persons other than the president or vice president are signing, a resolution or other certified evidence of authority must be attached to the mechanism that states that the signatories have the authority to sign on behalf of the principal. If needed for a signature, a copy of the power of attorney should be attached to the financial assurance mechanism and the corporate seal should be affixed.

c. The firm's name must appear in the caption of the financial mechanism (if the principal is a partnership).

d. The firm's name must appear in the caption and signatures of all owners on the financial statement (if the principal is joint ownership, but is not a partnership).

e. If applicable, a signature of the attorney-in-fact (representative granted power of attorney) acting on behalf of the issuing organization must appear on the financial mechanism; (The financial mechanism must be accompanied by a properly executed authorization of the power of attorney for the person signing the instrument.)

f. If applicable, the financial mechanism must contain the signature of the resident agent of the organization issuing the mechanism. The agent must be qualified to do business in the State where the facility will be located.

g. Each party must sign his/her own name.

h. For statements of intent from government entities for use by private companies, the applicant must ensure a properly signed agreement whereby the decommissioning costs the company would incur are treated as a business expense and will by agreement be absorbed by the government entity.

i. For self-guarantee, the applicant must ensure that it meets the criteria found in Appendix B (Section 11.2.9) of draft NUREG-1520.

3. The financial mechanism must be issued by an organization that has the legal authority to execute such an arrangement (e.g., for a surety company, check Circular 570; for other mechanisms, consult the checklists in Reg. Guide 3.66).

4. All financial mechanisms, including the original, any additions, and any replacements, must describe and pertain to the activities licensed pursuant to 10 CFR Parts 30, 40, and 70.

5. The financial assurance must be open-ended and cannot be canceled without at least 90 days advance notice to NRC.

6. The mechanism must allow for automatic collection by NRC before its expiration if the licensee cannot provide an acceptable alternative financial assurance mechanism 60 days after the receipt of notification of cancellation. The mechanism must not require proof of forfeiture.

7. When the mechanism is a bond or letter of credit, it must be accompanied by a standby trust to receive assets in the event the licensee defaults or goes bankrupt. A standby trust is recommended, but not required, for parent company guarantees. When the mechanism is a government security or certificate of deposit, it must be accompanied by either a standby trust or an escrow.

8. The mechanism should specify the NRC or State agency satisfactory to NRC as beneficiary. If the mechanism designates a State agency as the beneficiary, the applicant must submit written documentation to the NRC that will allow the NRC staff to verify that the State agrees to use any funds received to carry out the activities required for decommissioning.

9. The mechanism, or combination of mechanisms, must be sufficient at all times to cover all the costs of decommissioning.

10. The mechanism must clearly state the terms and conditions under which the applicant may cancel the mechanism and must provide for notification and approval by the State or Federal authority before cancellation by the company.

11. The mechanism must be established so that the financial assurance can be released after NRC has agreed that all license conditions for decommissioning have been met. The NRC will send written notification to the applicant allowing termination of the financial assurance mechanism and a return of any funds held.

12. Following NRC's approval of the mechanism, the following related requirements must still be met:

a. The applicant's financial assurance coverage must provide coverage throughout the term of the license. The need for cost estimate adjustments should be examined every 3 to 5 years.

b. If the current cost estimate exceeds the coverage because of inflationary increases or changes in plans, the applicant must arrange to increase coverage and submit evidence of the increase to NRC within 60 days after the cost estimates increase. If cost estimates decrease, the applicant may apply to the NRC for approval of a decrease in coverage.

c. The applicant may change the financial assurance mechanisms in use with prior written approval from NRC. The new mechanism, if approved, must become effective before or at the time the previous mechanism expires. If a letter of credit, surety bond, certificate of deposit, or government security is used, the applicant must also establish a standby trust fund.

d. An applicant should obtain alternative financial assurance coverage in the event of bankruptcy of the institution acting as trustee or issuing the financial mechanism.

e. The applicant must inform the NRC within 10 days after it or the organization issuing the financial mechanism learns of the applicant's bankruptcy proceedings.

f. If ownership or operating responsibility for the activities is transferred, NRC will not allow the applicant to terminate the original financial mechanism until such time as the new applicant has obtained an acceptable assurance.

g. The applicant is responsible for obtaining another financial assurance mechanism if the financial institution or corporate guarantor gives notice that it intends to cancel.

The staff will review the financial assurance mechanism submitted by the licensee by using the general and specific procedures provided in the following sections:

1. Escrow Accounts

The staff will ensure that an executed copy of the escrow agreement is provided by the applicant and that the amount of the fund is at least equal to the estimated cost of decommissioning.

The staff will review the checklist (Regulatory Guide 3.66) to verify that the licensee has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

2. Cash Deposits, Certificates of Deposit (CD), and Government Securities

The staff will ensure that the applicant has submitted a trust agreement or documentation pertaining to the applicant's licensed activities. The staff will verify that the licensee has deposited assets such as cash, certificates of deposit, or government securities with a third party such as a trust fund.

The staff will ensure that the amount of the cash deposit, CD, or government security is at least equal to the estimated cost of decommissioning.

CDS may be either negotiable or non-negotiable. If a negotiable CD is used the staff must verify that the CD is the property of a trust or escrow account established in accordance with decommissioning rules and guidance. If a nonnegotiable CD is used, the staff must verify that the CD names the trust or escrow account as payee (unless a State agency that can hold the funds will serve as trustee).

The staff will review the checklist of criteria in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using one of these mechanisms.

3. Trust Funds (Including Standby Trusts)

The staff will ensure that the applicant has provided information so that the staff can verify that the bank, savings and loan association, or other financial institution has the authority to act as trustee and that the trust operations are regulated and examined by a Federal or State agency. To determine whether the trustee is authorized to act as trustee the staff will refer to a list, published by the Comptroller of the Currency, of financial institutions that are federally authorized to act as trustee, or will contact the applicable bank regulatory agency to

determine State authorization. To determine whether the trustee's operations are regulated and examined by a Federal or State agency, the staff will refer to a list maintained by the Federal Deposit Insurance Corporation (FDIC) of all Federally regulated financial institutions, or will call the applicable state banking regulatory agency for verification of State regulated entities. For foreign banks with U.S. branches, the staff will contact the applicable State banking regulatory agency.

Where standby trusts are used, the staff will verify that the trustee is qualified to act as trustee by following the same method discussed above for verifying trusts. It will also verify that the standby trust agreement is an originally signed duplicate and that a certificate of acknowledgment accompanies the bond or letter of credit.

The staff will ensure that the amount of the trust fund is at least equal to the estimated cost of decommissioning.

The staff will review the checklists in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using these mechanisms.

4. Surety Bonds

The staff will ensure that a standby trust fund agreement accompanies the bond and that it complies with the suggested wording and documentation in Regulatory Guide 3.66.

The staff will ensure that the applicant has submitted information showing that the surety is listed as an acceptable surety in the most recent edition of Circular 570 of the U.S. Department of the Treasury and that the surety company is licensed in the State where the bond will be executed.

The staff will verify that the applicant reviewed the broker's or agent's power of attorney to ensure that the broker or agent is authorized by the surety to issue bonds in the necessary amount.

The staff will ensure that documentation provided by the applicant shows that the applicant will be responsible for notifying the NRC if the surety company intends to cancel or if it goes bankrupt.

The staff will ensure that the penal sum of the bond is an amount at least equal to the estimated cost of decommissioning.

The staff will review the checklist of criteria in Regulatory Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning.

5. Letters of Credit

The staff will ensure that the applicant has submitted information so that it can verify that the bank, savings and loan association, mutual savings bank, or credit union issuing the letter of credit has authority to issue letters of credit, and that the letter-of-credit operations are regulated and examined by a Federal or State agency. The staff will refer to a list maintained by the FDIC of all Federally regulated financial institutions or will call the applicable State banking regulatory agency for verification of State regulated entities. In addition, for foreign banks with U.S. branches, the staff will contact the applicable State banking agency.

The staff will ensure that the amount of the guarantee is at least equal to the estimated cost of decommissioning.

The staff will ensure that a letter of credit addressed to the NRC is submitted stating that the letter of credit is subject to the most recent edition of the *Uniform Customs and Practice for Documentary Credits*, published by the International Chamber of Commerce, or the *Uniform Commercial Code*, by Lawyer's Cooperative Publishing Company.

The staff will ensure that a standby trust fund agreement accompanies the letter of credit and that it complies with the suggested wording contained in Reg. Guide 3.66.

The staff will review the draft "sight draft" using Appendix A (Section 11.2.9) of draft NUREG-1520 to ensure that the terms of the letter of credit and the terms of the sight draft are consistent.[1]

[1] A "sight draft" is an order to the bank to pay on the letter of credit. It is an authorization to draw on the letter of credit upon receipt (upon "sight") of the draft.

The staff will review the checklist of criteria in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning.

6. Parent Company Guarantee

The staff will verify that the applicant presents evidence that it is a bona fide "going concern" and that it possesses positive tangible net worth.[2] The staff will review the letter from the chief executive officer of the licensee submitted to demonstrate compliance with these requirements.

The staff will verify that the applicant has provided a letter from the corporate parent's chief financial officer, which specifies that the corporation guarantees specified dollar amounts to fund decommissioning activities in the event of the applicant's default. The staff will also verify that the letter includes a financial statement and that it has adequate resources to cover the cost of decommissioning using alternative I or II of the financial test in Reg. Guide 3.66.

The staff will verify that the applicant has submitted a copy of an independent certified public accountant's opinion of the parent company's year-end financial statements and footnotes for the latest complete fiscal year.

The staff will verify that the applicant has submitted a special report on the corporate guarantor from an independent certified public accountant. The report should confirm that the financial data in the letter from the chief financial officer can be derived from the independently audited year-end financial statements and footnotes for the latest complete fiscal year. The report also should state that no matters came to the attention of the accountant that caused the accountant to believe that the information in the chief financial officer's letter should be adjusted.

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[2] A "going concern" is a firm that is expected to continue operating at least long enough for current expectations and plans to be carried out and for the reasonably foreseeable future period after that.

If there is any doubt about the qualifications of the certified public accountant, the staff will verify the accountant's credentials by contacting the State Board of Accountancy in the accountant's State.

The staff will ensure that the applicant has provided information that enables it to verify that the corporate parent has control of the licensee's voting stock and also satisfies the financial test. If there is any reason to question the validity of the financial data (e.g., if the corporate parent barely satisfies the financial test criteria), the staff will ask the firm to supply audited financial statements, or it should obtain Form 10-K from the U.S. Securities and Exchange Commission (SEC), and recalculate the financial ratios.

The staff will ask the corporate parent to provide NRC with documentation of any changes in its financial condition that would warrant filing Form 8-K with the SEC.

If necessary, the staff will use Moody's or Standard and Poor's bond rating guides to verify that bonds are rated as claimed.

If an accountant's opinion is unqualified (or clean), the staff will find the opinion acceptable for purposes of the parent company guarantee.

If an accountant's opinion is either adverse or a disclaimer of opinion, the staff will not allow the use of a parent company guarantee.

If an accountant's opinion is a qualified opinion (either an "except for" or a "subject to"), excluding opinions rendered on the basis of a "going concern issue," the staff will do the following:

a. Staff will ask the corporate parent to submit a copy of its latest financial statements. Alternatively, it could obtain a copy of the latest Form 10-K from the SEC.

b. Staff should thoroughly understand the accountant's opinion in the context of the financial statements so that it can determine the likelihood of the circumstances specified in the accountant's opinion, the accuracy of the financial assessment, and the ability of the firm to meet the costs being guaranteed.

c. If staff cannot make a decision because the information in the opinion or the financial statements is insufficient, it will require that the corporate guarantor submit additional information.

d. If the matter is still unresolved, staff will request assistance from NRC legal counsel.

The staff will ensure that the amount of the parent company guarantee is at least equal to the estimated cost of decommissioning.
The staff will review the checklist of criteria in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

7. Special Government Fund

The staff will ensure that the applicant provides written verification of its agreement with the State regulatory agency (acting as a trustee) indicating that the funds will be used only for decommissioning.

The staff will ensure that documentation of the special account is provided by the applicant and that the amount of the fund is at least equal to the estimated cost of decommissioning.

The staff will review the checklists in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

8. Insurance

The staff will ensure that documentation of the insurance policy is provided by the licensee and that the amount of the fund is at least equal to the estimated cost of decommissioning.

The staff will review the checklists in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

9. External Sinking Fund

The staff will ensure that documentation is provided by the applicant which indicates that a fund in the form of cash deposits in an escrow account, trust agreement, certificate of deposit, or government securities has been established.

The staff will ensure that documentation of a surety method (e.g., letter of credit, surety bond, or insurance) is supplied when this mechanism is used.

The staff will ensure that documentation of the external sinking fund and surety method is provided by the applicant and that the amount of the fund is at least equal to the estimated cost of decommissioning.
The staff will review the checklists in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

10. Statement of Intent

The staff will ensure that the applicant is a Federal, State or local government entity and that the officials signing the statement of intent have the authority to make such a commitment.

The staff will ensure that the amount of funds committed in the statement of intent is at least equal to the estimated cost of decommissioning.

The staff will review the checklists in Reg. Guide 3.66 to verify that the applicant has satisfied the conditions necessary for ensuring financial responsibility for decommissioning using this mechanism.

11. Statements of Intent from Government Entities for Use by Private Companies

The staff will review the agreements between the private companies and government entities to verify the government's intent to pay the decommissioning costs of the company.

12. Self-Guarantee Criteria

The staff will verify that the applicant has satisfied the criteria in Appendix B (Section 11.2.9) of draft NUREG-1520 for ensuring financial responsibility for decommissioning using this mechanism.

Bases for Selection of Application Contents and Agency Review Guidance

Section 9.2 “Financial Assurance Mechanisms” is drawn from Section 11.2 of draft Reg. Guide 3.52 and Section 11.2 of draft NUREG-1520. Only minor changes were made to eliminate redundant information.

10.0 ENVIRONMENTAL REPORT

Application Contents

This section provides guidance to the applicant for preparing the Environmental Report (ER). The ER, and other information developed or obtained independently by the NRC, is used by the NRC to prepare either an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), or an Environmental Impact Statement (EIS). The general information requirements for an ER are specified in 10 CFR § 51.45.

10.1 Description of Proposed Action

The description of the proposed action should include a brief description of the significant characteristics of the proposed facility, including the major site features and the major design and operating parameters. The description should address future construction -- such as, for example, additional vaults -- in terms of a proposed project schedule showing the dates for the initiation of site preparation, construction, and operation.

10.2 Purpose of Proposed Action

The statement of purpose should demonstrate a need for the proposed project. The information should explain the facts considered in concluding that the proposed action is necessary. The quantities of waste to be accommodated should be described, a projection of requirements for the services should be supplied, and alternative sources of supply for the proposed facility's services should be discussed. If delay of the proposed project would have effects on the nation's energy program or on the applicant's business (such as loss of contracts, jobs, or future business), these effects should be discussed.

10.3 Description of Affected Environment

The description of the affected environment should include the following:

1. Site location and layout;

2. Regional demography and land use;

3. Socioeconomics;

4. Regional historic, archaeological, architectural, scenic, cultural, and natural landmarks;

5. Meteorology and air quality;

6. Surface and groundwater hydrology;

7. Geology and seismology;

8. Terrestrial and aquatic ecology.

To the extent possible, this information should reflect observations and measurements made over a period of years.

10.4 Discussion of Considerations

The discussion of considerations should include the following:

1. Impact of the proposed action on the environment

   Impacts should be discussed in proportion to their significance and address the following:

   a. Effects of site preparation and construction on land use and water use;

   b. Effects of facility operation on human population and important biota;

   c. Any irreversible commitments of resources due to site preparation and facility construction and operation such as destruction of wildlife habitat, removal of land from agricultural use, and diversion of electrical power;

   d. Plans and policies regarding decommissioning and dismantling at the end of the facility's useful life;

   e. Environmental effects of the transportation of radioactive waste material to the site, and from the site at time of decommissioning;

   f. Environmental effects of accidents.

2. Adverse environmental effects

The information submitted should include any adverse environmental effects that cannot be avoided should the proposal be implemented. This discussion should make clear which of these effects are unavoidable and subject to later amelioration and which are unavoidable and irreversible.

3. Alternatives to the proposed action

The discussion of alternatives to the proposed action should be sufficiently complete to aid the NRC in developing and exploring, pursuant to section 102(2)(E) of the National Environmental Policy Act (NEPA), "appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form.

The discussion of alternatives should include (a) siting alternatives, (b) design alternatives, and (c) alternatives to the facility, itself. The following factors should be considered when comparing alternative sites:

a. Physical characteristics of the area, including demographic, geological, hydrological, meteorological, and seismological conditions of the site and surrounding area;

b. Location of power sources and transmission lines;

c. Location of major markets;

d. Availability of air, rail, roads, and water for transport of material and supplies;

e. Commitment of natural resources for site preparation and plant construction, including, but not limited to, the destruction or diminution of wildlife habitats, flora, woodlands, and marshlands;

f. Commitment of capital for site preparation and facility construction;

g. Cost of operation, including consideration of labor supply, prevailing wage rates, and other recurring or nonrecurring costs;

h. Availability of municipal services and facilities or, conversely, the cost of providing services such as health, education, water treatment, and sewage treatment;

i. Requirements for relocating homes and families;

j. Existing and projected land use and economic status of the community (e.g., urban, industrial, stable).

4. Relationship between short-term uses and long-term productivity

The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity should be discussed. Short-term uses are considered to be those that occur during the active life of the facility. Long-term productivity represents the use of the environment beyond decommissioning of the facility.

5. Irreversible or irretrievable commitments of resources

Any irreversible environmental commitments and irretrievable material resources that would be involved in the proposed action should be discussed.

10.5 Analysis of Environmental Effects of Proposed Action and Alternatives

The applicant should present the comparative effects by considering the environmental effects of the proposed action and the alternatives available for reducing or avoiding adverse environmental effects, as well as the environmental, economic, technical, and other benefits of the proposed action.

This analysis should quantify, to the fullest extent practicable, the various factors considered. To the extent that there are important qualitative considerations or factors that cannot be quantified, the analysis is acceptable if those considerations and factors are discussed in qualitative terms.

10.6 Federal and State Environmental Requirements

The applicant should include, as required by 10 CFR § 51.45(d), a list and the status of all federal permits, licenses, approvals, and other entitlements that should be obtained in connection with the proposed action.

Agency Review Guidelines

This provides guidance in performing technical reviews of the ER associated with an application for the issuance of a license for an AIF. The ER is reviewed to ensure that it is adequate to use to prepare an EA and a FONSI, or an EIS. The ER should be in accordance with the following.

1. Description of proposed action

   The description of the proposed action should include a brief description of the significant characteristics of the proposed facility, including the major site features and the major design and operating parameters. For future construction -- for example, of additional vaults -- the description is acceptable if it also includes a proposed project schedule showing the dates for the initiation of site preparation, construction, and operation.

2. Purpose of proposed action

   The statement of purpose should demonstrate a need for the proposed project, separate and apart from the possible future conversion of the AIF to a terminal LLW disposal facility. The information should justify the need for the project using at least the following information: 1) the quantities of wastes to be accommodated; 2) a projection of requirements for the services; and 3) alternative sources of supply for the proposed facility's services. If delay of the proposed project would have effects on the nation's energy program or on the applicant's business (such as loss of contracts, jobs, or future business), these effects should be discussed.

3. Description of affected environment

   The description of the affected environment should include the following:

   a. Site location and layout;
   b. Regional demography and land use;
   c. Socioeconomics, including low-income and minority populations;
   d. Regional historic, archaeological, architectural, scenic, cultural, and natural landmarks;
   e. Meteorology and air quality;
   f. Surface and groundwater hydrology;
   g. Geology and seismology;
   h. Terrestrial and aquatic ecology.

To the extent possible, this information should reflect observations and measurements made over a period of years.

4. Discussion of considerations

The discussion of considerations should include the following:

a. Impact of the proposed action on the environment. This discussion should address these impacts in proportion to their significance and addresses the following:

i. Effects of site preparation and construction on land use and water use;

ii. Effects of facility operation on human population and important biota;

iii. Any irreversible commitments of resources because of site preparation and facility construction and operation such as destruction of wildlife habitat, removal of land from agricultural use, and diversion of electrical power;

iv. Plans and policies regarding decommissioning and dismantling at the end of the facility's useful life;

v. Environmental effects of the transportation of radioactive waste material to the site, and from the site at the time of decommissioning;

vi. Environmental effects of accidents.

b. Adverse environmental effects

The information submitted should include any adverse environmental effects that cannot be avoided should the proposal be implemented. This discussion should make clear which of these effects are unavoidable and subject to later amelioration, and which are unavoidable and irreversible.

c. Alternatives to the proposed action

The discussion of alternatives to the proposed action should be sufficiently complete to aid the NRC in developing and exploring, pursuant to section 102(2)(E) of NEPA, "appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." To the extent practicable, the environmental impacts of the proposal and the alternatives should be presented in comparative form.

The discussion of alternatives should include siting alternatives, design alternatives, and alternatives to the facility, itself. The following factors should be considered when comparing alternative sites:

i. Physical characteristics of the area, including demographic, geological, hydrological, meteorological, and seismological conditions of the site and surrounding area;

ii. Location of power sources and transmission lines;

iii. Location of major markets;

iv. Location of raw materials, components, and sources of supply;

v. Availability of air, rail, roads, and water for transport of material and supplies;

vi. Commitment of natural resources for site preparation and plant construction, including but not limited to the destruction or diminution of wildlife habitats, flora, woodlands, and marshlands;

vii. Commitment of capital for site preparation and facility construction;

viii. Cost of operation, including consideration of labor supply, prevailing wage rates, and other recurring or nonrecurring costs;

ix. Availability of municipal services and facilities or, conversely, the cost of providing services such as health, education, water treatment, and sewage treatment;

x. Requirements for relocating homes and families;

xi. Existing and projected land use and economic status of the community (e.g., urban, industrial, stable).

d. Relationship between short-term uses and long-term productivity

The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity should be discussed. Short-term uses are considered to be those that occur during the active life of the facility. Long-term productivity represents the use of the environment beyond decommissioning of the facility.

e. Irreversible or irretrievable commitments of resources

Any irreversible environmental commitments and irretrievable material resources that would be involved in the proposed action should be discussed.

5. Analysis of environmental effects of proposed action and alternatives

The analysis should consider and balance the environmental effects of the proposed action and the alternatives available for reducing or avoiding adverse environmental effects, as well as the environmental, economic, technical, and other benefits of the proposed action.

This analysis should quantify, to the fullest extent practicable, the various factors considered. To the extent that there are important qualitative considerations or factors that cannot be quantified, the analysis should discuss those considerations and factors in qualitative terms.

The analysis should contain sufficient data to aid the NRC in the development of an independent analysis.

6. Federal and State requirements

The list required by 10 CFR § 51.45(d) of all Federal permits, licenses, approvals, and other entitlements, which must be obtained in connection with the proposed action, is acceptable if it is complete and current as of the application date.

The reviewer will also review the discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations and thermal and other

water pollution limitations or requirements that have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. The applicant's discussion is acceptable if it is complete, current, and correct.

The discussion should include, but not be limited to, the following additional Federal laws and Executive Orders, as appropriate:

a. The Coastal Zone Management Act of 1972

The purpose of this Act is to encourage and assist states in developing management programs that preserve, protect, develop, and, where possible, restore the resources of the coastal zone. Activities of Federal agencies that directly affect the coastal zone shall be consistent with approved state coastal management programs (CMPs) to the maximum extent practicable.

The reviewer will confirm that the applicant has determined whether the proposed actions could affect a coastal area governed by a federally-approved CMP. When an activity affects a federally-approved State CMP, and the activity is pre-listed in the CMP, NRC approval of the activity shall be withheld until the State has concurred or the Secretary of Commerce has overridden the State's objection. The State has 6 months to complete its review. When an activity affects a Federally-approved state CMP, but the activity is not prelisted in the CMP, approval shall be withheld for 30 days to allow the State to notify NRC that their review is necessary.

b. The National Historic Preservation Act of 1966

Section 106 of the Act and implementing regulations (36 CFR 800) require an agency head with jurisdiction over a Federal, Federally-assisted, or Federally licensed undertaking to take into account the effects of the agency's undertaking on properties included in or eligible for the National Register of Historic Places and, prior to approval of an undertaking, to afford the Advisory Council on Historical Preservation a reasonable opportunity to comment on the undertaking.

Section 110(f) of the Act requires that Federal agency heads, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to a National Historic Landmark that may be

directly affected by an undertaking and, prior to approval of such undertaking, afford the Council an opportunity to comment. The Act's requirements are to be implemented in cooperation with State Historic Preservation Offices and Indian tribes.

c. The Endangered Species Act

Section 7 of the Act and implementing regulations (50 CFR Part 402) require every federal agency, in consultation with and with the assistance of the Secretary of the Interior or Commerce, as appropriate, to ensure that any action it authorizes, funds, or carries out, is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of its critical habitat.

d. The Fish and Wildlife Coordination Act

The Act requires consultation with State agencies before impoundment, diversion, or modification of any body of water. The Act specifically includes consideration of the effects of domestic sewage, mine, petroleum, and industrial wastes.

e. The Wild and Scenic Rivers Act

The act prohibits construction of any water resources project that would have a direct adverse effect on the values for which a wild and scenic river was established.

f. Executive orders

Executive orders, such as those applying to wetlands preservation, that could apply to licensees performing new construction.

g. Others

In addition, with respect to minority and low-income populations, the NRC must: 1) identify and address disproportionately high and adverse human health or environmental effects on low-income and minority populations, 2) ensure that these populations have access to public information related to human health and the environment, and 3) conduct activities that do not discriminate against these populations.

Bases for Selection of Application Contents and Agency Review Guidance

Information was taken primarily from draft Reg. Guide 3.52 and draft NUREG-1520 appropriately modified to reflect the nature of an AIF and the fact that byproduct, source, and special nuclear materials will all be possessed at the facility in varying amounts. This approach was selected on the basis of a judgment that the scope of the Part 70 guidance was more appropriate to the preparation of an ER for an AIF than that found in the corresponding guidance for a Part 61 LLW disposal facility; i.e.: *Standard Format and Content of Environmental Reports for Near-Surface Disposal of Radioactive Waste,* Reg. Guide 4.18; and *Environmental Standard Review Plant for the Review of a License Application for a Disposal Facility*, NUREG-1300. In particular, the Part 61 guidance is heavily influenced by the fact that a LLW disposal facility is, by definition, intended as the final, terminal location for the radioactive material in question. An AIF, however, is not being licensed for disposal. Accordingly, guidance pertinent to evaluating the environmental impacts associated with a permanent site are beyond the proper purview of an ER for an AIF.

Part 70 application guidance pertinent to the establishment of a comprehensive "Environmental Safety Program" is not prescribed in this document since such a program is not judged to be pertinent to an AIF. Applicable provisions relevant to such things as environmental monitoring, however, have been provided for, as appropriate.